June 1985 No. 39

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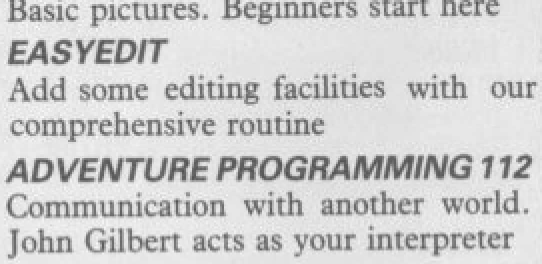


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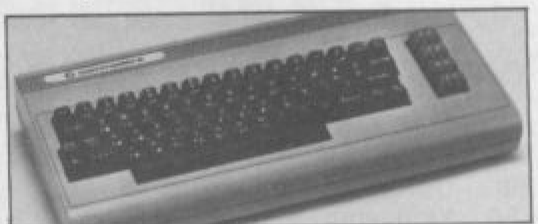
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If you would like to contribute to *Sinclair User* please send programs or articles to:
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Original programs should be on cassette and articles should be typed. We cannot undertake to return them unless a stamped-addressed envelope is included.
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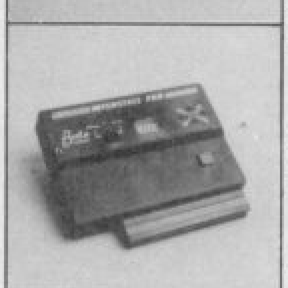
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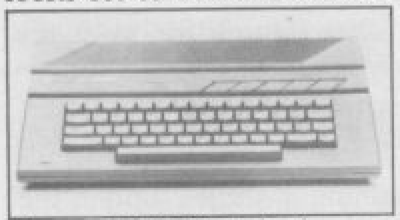
Rivals in hot pursuit

SPRING is in the air and new micros are popping out all over. Meanwhile the high street stores are clearing out last year's dead wood and Commodore appears to be the first victim.

Sales of the C64 have been temporarily discontinued by Boots and Lasky, who blame Commodore's eccentric pricing policy for the decision.

"We currently have no 64s in stock," explains John Greengrass, head of Boots' computer department, "and we cannot afford to buy any more from Commodore at a loss."

If Commodore seems to be losing its grip on the market, both Amstrad and Atari are consolidating theirs. The new Amstrad machine, the CPC 664, looks set to be as successful as its predecessor, the 464. It is selling for £339, with a monochrome monitor, and £449 with colour.



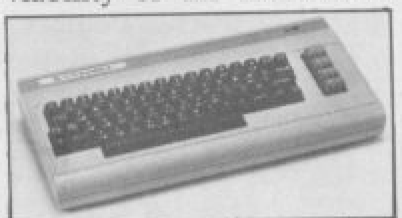
The new 130XE from Atari

Atari, continuing its bid for world domination, has launched the 130XE, a 128K eight-bit micro costing £170.

The company has also unveiled its QL competitor at the Hanover Fair. The 520ST, the first in a range of 16-bit machines, will sell for £700. It will be available in September.

From Acorn comes the BBC B Plus, a 64K upgraded model B, selling for just under £500. Price reductions look likely for the model B now.

The problems presently suffered by Commodore will probably affect the launch of its C128 computer, scheduled for the late summer. Boots and Lasky have suggested that they will not be placing orders until the viability of the machine is assessed, and until Commodore adopts a sensible price strategy.



Commodore 64: on the way out?

As for Sinclair, sales of the Spectrum continue to be very satisfactory, according to Boots. The QL, however, continues to show unremarkable progress, and the planned portable, called Pandora, is firmly scheduled for next year.

Crackdown on pirates

SOFTWARE HOUSES are banding together to stamp down on piracy and a number of people have been taken successfully to court.

Rod Evans of New Generation took Anthony Yarnold, a London council worker, to court after seeing an advertisement offering well known games for a pittance. "I didn't like the look of it – this company, Leosoft, was advertising top-selling software, two for £5.00."

Evans ordered two games, **Knot in 3D** – one of New Generation's games, and Quicksilva's **Ant Attack**. "They were rip-offs," he says, "with photocopied cassette inlays." He then got in touch with his local Trading Standards Office, which managed to trace Yarnold, who admitted copying cassettes.

Yarnold was fined £400 on two charges of false trade descriptions and ordered to pay £190.

A group of software houses, led by Artic, has also been active, bringing civil action against four people accused of pirating.

Damages were not pressed but they did admit to copying software and were bound by the court not to repeat their activities.

Micronet price increase

MICRONET has increased its subscription from £8.00 to £10.00 a quarter. This is the first increase since the database was launched two years ago and will commence on June 1.

The database has grown extensively from those early days in March 1983 and many services have been added, including the extension of local call access, Mailbox, Chatline, Celebrity Chatline and Gallery.

Gallery allows subscribers to purchase one or more pages of the database – each page consisting of 26 frames.

They will be able to compose their own frames either with information or designs and edit them accordingly. In fact each subscriber will have control of their own mini-database on Micronet.

The cost to purchase one frame for six months is 25 pence and the editing charge is four pence per frame.

Micronet will retain ultimate control over the content of subscribers' pages, and will not interfere unless the rules are contravened by libellous or obscene material and information such as hacking tips.

Births, marriages and deaths

BUG-BYTE, one of the original ZX-81 software houses which later gained fame with **Manic Miner** has gone into liquidation.

Buffer Micro has shut up shop and called in the liquidators.

The infamous **Automata** team of Christian Penfold and Mel Croucher has split up. Mel Croucher has set up a company to deal with new ventures.

In another blast from the past, **Virgin** has plans to relaunch **Rabbit Software** as a budget label.

Kempston Micro, manufacturers of joysticks and interfaces, is branching out. **Orpheus Software** has been chosen to develop its new range of titles.

Quicksilva, now part of the Argus Group, has been transferred from Southampton to London. Quicksilva's boss Rod Cousens has resigned and is setting up a new software house.

Activision has lost, and **Melbourne House** has gained, a managing director. The man making the news is Geoff Heath, formerly UK boss of Activision.

Another company to bite the dust is **Romik**. The news that the company is insolvent and has ceased trading follows a year in which little has been heard from Romik.

Channel 8, the company marketing **Digital Fantasia** adventure games has gone into liquidation.

Ariolasoft has recently pulled off a deal to licence **Ram Jam's** products in the UK and abroad.

Strange things are happening at **Fantasy Software**. Telephones are 'temporarily out of service' and Bob Hamilton, who owns the company with Paul Dyer, admits, "We have gone into dormancy for a while."

more news on page 6

Pocket telly big in US



THE ill-starred pocket TV, which has been available in the UK for 18 months without anybody noticing, is going down extremely well in the US, according to Sinclair Research.

Sinclair claims the flat-screen TV, a long-cherished dream of Sir Clive's, has been selling well through a promotion in the States involving the credit card giant American Express. Initial orders of 10,000 are quoted, with predictions of a further 10 to 15000 a month.

The TV, which can tune itself to signals anywhere in the world, has not proved so popular in the UK. Nevertheless, Sinclair reports increased sales recently with regional distributors expressing interest as well as London stores.

No figures for sales are forthcoming, but Bill Jeffrey, the overlord of Sinclair's TV operation, says research shows enormous potential in the UK, and "a high level of satisfaction among existing owners."

Meanwhile, Sir Clive has been talking to at least two companies over selling the rights to manufacture and market the product. If those moves are successful, the money raised should enable Sinclair to pay off a substantial proportion of its current overdraft.

On the other hand, the current reticence on UK sales figures must surely indicate that the world's first flat-screened portable TV has still fallen well short of the initial hopes Sir Clive had for the invention he has been pursuing for 20 years.

Beyond the new monolith

BEYOND Software is launching a new software label called Monolith.

Monolith and Beyond will be run as two autonomous companies. Each label will be targeting its games at different audiences; Monolith will be mainly arcade-style games as opposed to the detailed strategy/adventure programs like **Lords of Midnight**.

"Monolith is a marketing vehicle which allows us to produce software and to acquire character licences from TV and film," says a Beyond spokesman.

The first two games to be launched by Monolith at the end of June will retail at £9.95 and are **Rockford's Riots** — a follow-up to **Boulder Dash** which will be on the B side, licensed from First Star — and **Quake Minus One** by Mike Singleton, of **Lords of Midnight** fame, and Warren Foulkes.

The game is set in the USA where there is a vast mining complex under the sea run by robots. They threaten to cause an earthquake which will topple California into the drink and you have only one day in which to sort out the mess.

Characters licensed from TV and film will be a major part of the Monolith look, and a game to be released by Monolith in September will have an even larger character licence than **Ghostbusters** — obviously one to look forward to.





Sinclair in trouble?

RUMOURS that Sinclair Research is in deep financial trouble have been flying around recently, with stories of a collapse in share prices from £34 to £11. A story in the *Observer* suggested there was no demand for Sinclair stock, and that Sinclair Research would experience problems raising finance for future projects.

"The *Observer* has a vivid imagination," says Sir Clive. "Sinclair Research has large stocks of Spectrums because the retail trade got their calculations badly wrong at Christmas. We have 300,000 machines, and so we have rescheduled production."

Sinclair Research also has a £5m overdraft, against £8.5m cash at the same time last year. "We're all right for the time being," says Sir Clive, "but I'd rather not have one." It is not a disastrous situation for a company with stocks worth £34m, but neither does it inspire confidence among potential investors in future projects, such as the planned semi-conductor plant for waferchip products which requires £50m to set up.

Sinclair Research apparently made a small loss in January but improved sales in February and March. World-wide supplies of Spectrums are now said to be running at a little under 200,000 a month, the target figure for production.

On the subject of shares, and reports that large numbers of Sinclair shares have been sold, Sir Clive said he knew nothing of any share movements. A spokesman for Sinclair Research threw some light on the situation by explaining that one person had sold 50 shares for about £10 pounds each, and consequently a few hundred more were sold in another transaction. "That's out of four million shares," says the spokesman. It appears that reports may have been influenced by rumours in the City stemming from the one small transaction.

"I don't know much about financial markets," joked Sir Clive, "but they do tend to overreact."

Hackers in the dock

FOLLOWING the recent problems Prestel has experienced with hackers, Robert Schifreen, 21 from Edgware and Stephen Gold, 29 from Sheffield, have been charged with forgery under Section 1 of the Forgery and Counterfeiting Act, 1981.

Between them, Schifreen and Gold have been charged with allegedly forging electrical devices for recording information on the Prestel Gateway test computer, the Vampire facility of the Kipling computer and the Keats and Dickens computers.

Police raided both men's homes on March 27 and confiscated computers and electrical equipment.

On April 3 both were remanded on unconditional bail until June 12 when the case will be heard at Bow Street Magistrates Court.

The maximum fine or term which Schifreen and Gold can be charged with under Section 1 of the Forgery and Counterfeiting Act, 1981, is £1000 or six months imprisonment.

C5 in advertising controversy

THE Sinclair electric trike has now come in for criticism from the Advertising Standards Authority, which has attacked the C5 advertising campaign.

According to a leaked draft of the report, the ASA criticises the claims made that the machine is "safer than anything on two wheels", and that it cruises at twice the speed of a bicycle.

Bill Nichols, a spokesman for Sinclair Vehicles, says the report is only a draft and the company has an opportunity to reply to the charges before the final judgement.



The revelations are clearly embarrassing to Sinclair Vehicles, since they follow stories in the press about Holland banning the C5 on safety grounds.

"The changes we are making to the C5 are simply to comply with local laws," says Nicholas. "We also have to put on a colour code to indicate the insurance class of the vehicle."

Production of the C5 in Wales has been cut from 1000 a week to 100. Of the 100 workers, 90 have been reassigned to producing Hoover washing machines. Nichols blames the bad winter for poor sales in the UK.

The first prosecution involving a C5 has been thrown out of court.

It involved a Kent University student who was pedalling a C5 back from a charity ball. He was arrested by the police who alleged he was drunk and prosecuted accordingly.

more news on page 8

New releases

IN **Cauldron**, from Palace Software, you play the part of a witch in an exciting arcade adventure. **Cauldron** is priced at £7.99.

A View to a Kill is the latest Bond movie and Domark is releasing the Spectrum version to coincide with the premiere. **A View to a Kill** will be stalking the streets on June 7, priced at £10.99.

Firebird has come up with **Don't Buy This** at £2.50 and is a compilation of five of the worst games submitted.

On the subject of Firebird, a gremlin appeared in the **Gyron** review — May, *Sinclair User* where we said that a Porsche 924 would be won by the first person to wrest the code from Necropolis. If by November 6 there is more than one correct entry, a play-off will be held for the prize. And if you are stuck for clues, look carefully at the face on the Cassette box.

The Fourth Protocol, based on the novel by Frederick Forsyth, has been delayed due to a programming hitch and will be released on June 20 for £12.95.

A new game from Hodder & Stoughton is called **Rats**, based upon the nauseating best seller by James Herbert. Due to be released in September, it will put you back £6.95, or £8.95 with the book.

Dun Durach, the prequel to *Tir Na Nog* is Gargoyle's latest release. Retailing at £9.95, it will be released on May 30.

Congratulations

WELL OVER 4,000 entries were submitted for the **Monty is Innocent** competition in the April issue of *Sinclair User*. The 50 winners, who rescued Monty from cell B, after picking up the gun, key and potion, are printed below. Each receives a copy of the game, and in addition the first 10 have been made members of the Gremlin Gang.

A Caldwell, Braintree, Essex; David Miller, New Barnet, Hertfordshire; R Robinson, Dorking, Surrey; Mark Soutar, Forfar, Angus; Paul Brown, Worthing, Sussex; Darren Furnell, Swindon, Wiltshire; Jonathan Snape, Kidsgrove, Staffordshire; Ian Acreman, Wimbourne, Dorset; Scott Blackwell, Higham Ferrers, Northamptonshire; T Morgan, Hull, Humberside; Ashley Stoner, Crowborough, East Sussex; T Breckon, Skelton, Cleveland; Paul Presley, London SW3; Nicholas Bromley, Carlton-in-Cleveland, Middlesborough; Matthew Bradford, Edenbridge, Kent; Matthew Chisholm, Wokingham, Berkshire; I D Cannon, Ashford, Kent; George Welson, Branston, Lincolnshire; A J Philpott, Broadstairs, Kent; John Harragan, Chelmsford, Essex; Alexander Botten, Nuneaton, Warwickshire; E Stafford, Sleaford, Lincolnshire; Vince Teo, Hertford, Hertfordshire; Trevor Pawson, Toynton All Saints, near Pilsby; B Tongue, Northallerton, North Yorkshire; Lee R Hand, Harwich, Essex; Andrew Henry, Southampton, Hampshire; Mark Menzies, Birmingham; Kevin Roberts, Bishops Middlesham, County Durham; Nicky Gibson, Thornaby, Cleveland; Stuart Beeson, Kempston, Bedfordshire; Bevis Robins, Megavissey, Cornwall; David Grozier, Houghton-le-Spring, Tyne and Wear; Paul J Saunders, Gosport, Hampshire; M Austwick, Cowplain, Hampshire; Gregory McDougall, Birmingham; Nicola Milligan, Scarborough, North Yorkshire; James Wheeler, Orpington, Kent; Jon Goodheart, Witham, Essex; Trevor Pudney, Chelmsford, Essex; Craig Lovelace, Whepstead, near Bury St Edmunds; J Horswell, Plymouth, Devon; Kenneth Ogden, Cardiff, South Glamorgan; D Stephenson, Cramlington, Northumberland; H T Lawrenson, Billinge, near Wigan; Iona Pollard, near Shaftsbury, Dorset; James Wilson, Maidenhead; C M Clementson, Southport, Merseyside; Mark Rose, Lutterworth, Leicestershire; Mark Livingston, Irvine, Ayrshire.

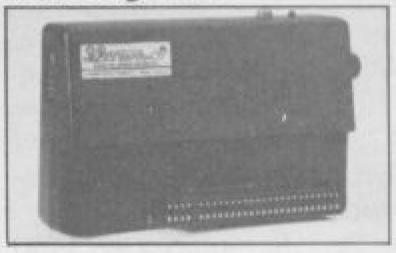
The response to the Sinclair C5 competition in the April issue was also enthusiastic, with over 2,000 entries. The correct answer to the puzzle tree was MEMORY and the first solution out of the hat came from J W Emmett, of Bradford, West Yorkshire, who is now the proud owner of a C5. The three runners-up, who each win a Sinclair pocket TV, are L R Gudalajtys, of Carlton, Nottingham; M Paice, of Berkhamsted, Hertfordshire; and R Hill, from Margate, Kent.

War in slow motion

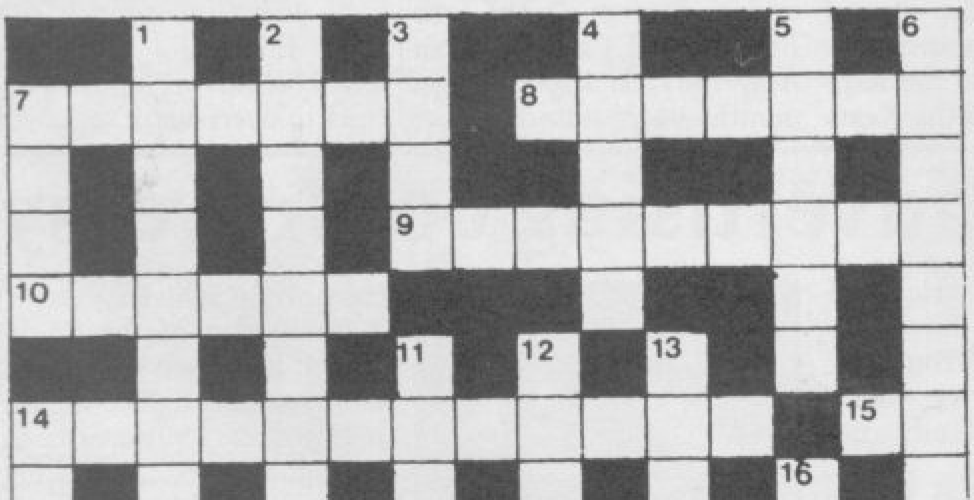
NIDD Valley has released two joystick interfaces incorporating its Slomo invention, a device to slow down arcade games so you can get more time to think.

The Pace-Setter interfaces are said to give full control over the speed of games even while you play. There are two interfaces, a programmable one at £24.95 and a non-programmable interface at £14.95. Both incorporate an on-off switch and an LED to indicate the mode of speed being used.

Nidd Valley is anxious that other companies may be about to infringe the patent of the invention, which has been applied for. A spokesman for the company is concerned that potential customers should make sure the product they buy has the Slomo logo on it.



ZXWORD by Henry Howarth



Across

7. Mathematical expression of mural design (7)
8. The inventor of an engine with a difference! (7)
9. Fire-arm involuntary? (9)
10. Parent on the chip board? (6)
14. Iron rings in old computers (7,5)
15. Two vowels, that is (2)
17. Some correlation with logical element (2)
18. Spread muck around fact you heard to be fabricated (12)
21. Sounds unmusical (6)
23. He'd play or rewrite rapid cassette software (5-4)
25. Adrian's unusual angularity? (7)
26. Compact a long time into the software suite (7)

Down

1. Reprints ruined by these devices (8)
2. Base twelve (10)
3. Information may be raw (4)
4. Card job for forecasting? (5)
5. Chess move could throw the French (6)
6. Some from the club — each heading team in war game (5-4)
7. Fusable read-only memory (4)
11. Node used to be in the student's union (5)
12. Real time language that Carol finds confusing (5)
13. RS232, perhaps, in concerts (10)
14. Loud but not high church art provides diagram (9)
16. Garbage game hasn't RAM sort (8)
19. Currently induced to resist (6)
20. Empty tape for apprentice in the bank (5)
22. Salvage a file from BASIC (4)
24. Introduce drugs as semiconductor impurity (4)

Solution on page 126

QCOM alive and well

THE QCOM modem system is alive and kicking again in spite of the collapse of OEL, the company responsible for its design and production.

Sinclair Research has always seen the system as an important peripheral for the QL, essential for much business operation.

The demise of OEL was a serious blow to the QL, suffering as it was at the hands of an increasingly sceptical UK market.

Tandata, a company specialising in communications equipment, has now bought the rights to manufacture and sell the system, as well as existing stocks of modems which were never released.

As yet there is no firm news on price or availability, but Tandata is expected to sell QCOM through its own distribution network. QCON will probably be sold for slightly more than the £79.95 originally quoted, whereas QMOD and QCALL will probably remain at the old prices.

Tandata is also likely to change the name of the whole system from QCOM to QLINK. The change is logical given that Tandata created the Homelink system in conjunction with the Nottingham Building Society and the Bank of Scotland, whereby new homes get a built-in computer terminal enabling banking transactions to be carried out from home.

Sinclair Research has played an active part during the negotiations, which have been conducted in the midst of persistent and frequently inaccurate rumours. "We're pretty pleased that QCOM has finally seen the light of day" says a spokesman. "What's that phrase the footballers use? We're over the moon."

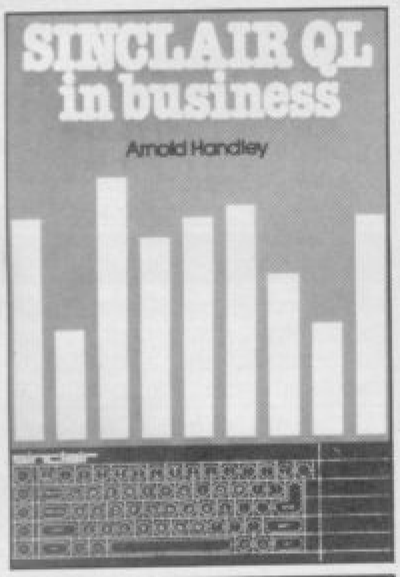
Not so happy is Lawrence Cook of OEL, who designed QCOM. "When Prism and Oric went bust they owed us rather a lot of money," he says. According to Cook, had OEL been able to complete the finishing touches to the QCOM package it might have avoided liquidation.

Serious business?

QL USERS looking for efficient ways to contribute to their bank balance will be interested in a new book by Arnold Handley.

Sinclair QL in Business is a racy, irreverent look at the possibilities of the machine.

It concentrates very much on the applications of software, but goes beyond the manual in describing numerous "unofficial" ways of using the Psion programs. It is published by Newnes Microcomputer Books, and costs £9.95.



Better super software

DIGITAL Precision, whose first QL products are reviewed elsewhere in this issue, has already released upgrades of its **Super Sprite Generator, Super Backgammon** and **Super Monitor** programs.

The improvements are said to have developed from a questionnaire sent out with mail order copies, in which customers were asked to criticise the programs.

We have not yet had an opportunity to investigate the claims thoroughly, but our review of **Super Backgammon** does require some modification. Two new playing levels have been added, 'for really strong Backgammon players'.



Generating a standard

METACOMCO is about to release its version of Pascal for the QL. The package conforms to the full ISO international standard, according to David Sykes of Metacomco, and will cost £89.95.

"The price reflects the quality of the software" says Sykes. "It is a true single pass compiler which generates 68000 code directly."

That contrasts with the Computer One **Pascal**. The Metacomco version, if it lives up to the claims made for it, will be considerably superior.

Details can be obtained from Metacomco at 26 Portland Square, Bristol BS2 8RZ. Tel: 0272 428781.

Sinclair's QL armada

FOREIGN language versions of the QL are now coming into production, with software packages translated.

The first of the new machines, a Spanish version, has already been launched, and Sinclair Research is to follow that with French, Italian and Danish. Further planned launches include Turkish, Greek, German, Dutch, Portuguese, Norwegian, Swedish, Finnish, and Arabic.

"Some countries, such as Greece, require completely different keyboards, and others, such as France have different keyboard layouts," says a spokeswoman.

Market success

ENTHUSIASM for the QL in Europe is growing, according to companies involved in supporting the machine.

Cambridge Systems Technology, which produces the Q-disc controller and markets Computamate disc drives, has announced a mutual endorsement deal with software house Computer One, publishers of **QL Pascal** and **Forth** programs, with a particular eye on the European market.

"Over 75 per cent of our QL software is sold on the continent," says Paul Ives of Computer One, and with CST the company is developing a package of software and hardware.

Customers in the UK will also be able to benefit from the deal between the two companies, with a planned voucher scheme whereby purchasers of CST hardware will receive money-off vouchers for Computer One software.

MSX · TATUNG EINSTEIN · ZX SPECTRUM · SINCLAIR QL · AMSTRAD CPC 464 N

Thinking so ...thi

THE TASWORD WORD PROCESSORS

The extensive features of the Tasword word processors are ideal for both the home and business user. Every Tasword comes complete with a comprehensive manual and a cassette or disc. The cassette or disc contains your TASWORD and TASWORD TUTOR. This teaches you word processing using TASWORD. Whether you have serious applications or simply want to learn about word processing, TASWORD and TASWORD TUTOR make it easy and enjoyable.

TASWORD TWO (Spectrum)

64 characters per line on che screen!

"Without doubt, the best utility I have reviewed for the Spectrum." HOME COMPUTING WEEKLY APRIL 1984

"If you have been looking for a word processor, then look no further." CRASH JUNE 1984

The cassette program is supplied with instructions for microdrive conversion.

TASWORD TWO* ZX 48K Spectrum
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microdrive cartridge **£15.40**

TASWORD 464

"There is no better justification for buying a 464 than this program."
POPULAR COMPUTING WEEKLY NOVEMBER 1984

A particularly sophisticated yet easy to use program. Now available on disc. The cassette version is supplied with instructions for transferring to disc.

TASWORD 464* Amstrad CPC 464
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disc **£22.95**

TASWORD EINSTEIN

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TASWORD EINSTEIN Tatung Einstein
disc **£19.95**

TASWORD MSX

With all the features of the Spectrum Tasword Two including the amazing sixty four character per line display. The Tasword MSX machine code program utilises the 32K of memory not normally available to Basic allowing over five hundred lines of text to be held in memory.

TASWORD MSX* 64K MSX Computers
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(cassette includes both disc and tape versions)

THE TASCOPY SCREEN COPIERS

The TASCOPY screen copiers print high resolution screen copies with different dot densities and patterns for the various screen colours. This gives the screen copies a shaded effect which presents on a monochrome scale the colours on the screen. With TASCOPY you can keep a permanent and impressive record of your screen pictures and diagrams. TASCOPY supports all the printers mentioned under TASPRINT.

TASCOPY (Spectrum + Interface 1)

The Spectrum TASCOPY is for use with the RS232 output on ZX Interface 1. It produces monochrome copies (in a choice of two sizes) as well as copies with the shaded "grey scale" effect described above.

TASCOPY ZX Spectrum cassette **£9.90**
microdrive cartridge **£11.40**

TASCOPY 464

Adds two new commands to the 464 Basic to give both a standard shaded screen copy as well as a "poster size" copy which is printed onto two or four sheets which can be cut and joined to make the poster.

TASCOPY 464 Amstrad CPC464 cassette **£9.90**
disc **£12.90**

TASCOPY QL

TASCOPY QL adds new commands to QL Superbasic. Execute these commands to print a shaded copy of the screen contents. Print the entire screen or just a specified window. TASCOPY QL also produces large "poster size" screen copies on more than one sheet of paper which can then be cut and joined to make the poster, and high speed small copies.

TASCOPY QL Sinclair QL
microdrive cartridge **£12.90**

THE TASPRINT STYLE WRITERS

A must for dot-matrix printer owners! Print your program output and listings in a choice of five impressive print styles. The Tasprints utilise the graphics capabilities of dot matrix printers to form, with a double pass of the printhead, output in a range of five fonts varying from the futuristic data-run to the hand writing simulation of Palace Script. A TASPRINT gives your output originality and style! The TASPRINTS drive all Epson compatible eight pin dot-matrix printers, e.g.

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EPSON RX-80
EPSON MX-80 TYPE III
NEC PC-8023B-N
MANNESMANN TALLY MT-80
STAR DMP 501/515
BROTHER HR5
SHINWA CP-80
COSMOS-80
DATAC PANTHER
DATAC PANTHER II

Five impressive print styles for your use:-

COMPACTA - bold and heavy, good for emphasis
DATA-RUN → A FUTURISTIC SCRIPT
LECTURA - clean and pleasing to read
MEDIAN - a serious business-like script
Palace Script - a distinctive flowing font

Typical Tasprint output. Please note that different makes of printer produce different sized output.

TASPRINT (Spectrum)

Drives all the printer interfaces compatible with TASWORD TWO and can be used to print TASWORD TWO text files as well as output from your own Basic programs.

TASPRINT 48K Spectrum cassette **£9.90**
microdrive cartridge **£11.40**

TASPRINT 464

Can be used to print AMSWORD/TASWORD 464 text files in addition to output from your own Basic programs. Drives the Amstrad DMP 1 in addition to the printers listed to the left.

TASPRINT 464 Amstrad CPC 464 cassette **£9.90**
disc **£12.90**

TASPRINT QL

TASPRINT QL includes a screen editor used to modify files created by other commercial software, such as QUILL, or by the user from BASIC. These modified files include TASPRINT control characters and may be printed, using TASPRINT, in one or more of the unique TASPRINT fonts.

TASPRINT QL Sinclair QL
microdrive cartridge **£19.95**

4 MSX · TATUNG EINSTEIN · ZX SPECTRUM · SINCLAIR QL · AMSTRAD CPC 464

ftware?...

nk Tasman

OTHER TASMAN PRODUCTS FOR THE ZX SPECTRUM

TASMERGE

The Mail Merger

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TASMERGE ZX 48K Spectrum **£10.90**

TASWIDE

The Screen Stretcher

With this machine code utility you can write your own Basic programs that will, with normal PRINT statements, print onto the screen in the compact lettering used by TASWORD TWO. With TASWIDE you can double the information shown on the screen!

TASWIDE ZX 16K + 48k Spectrum **£5.50**

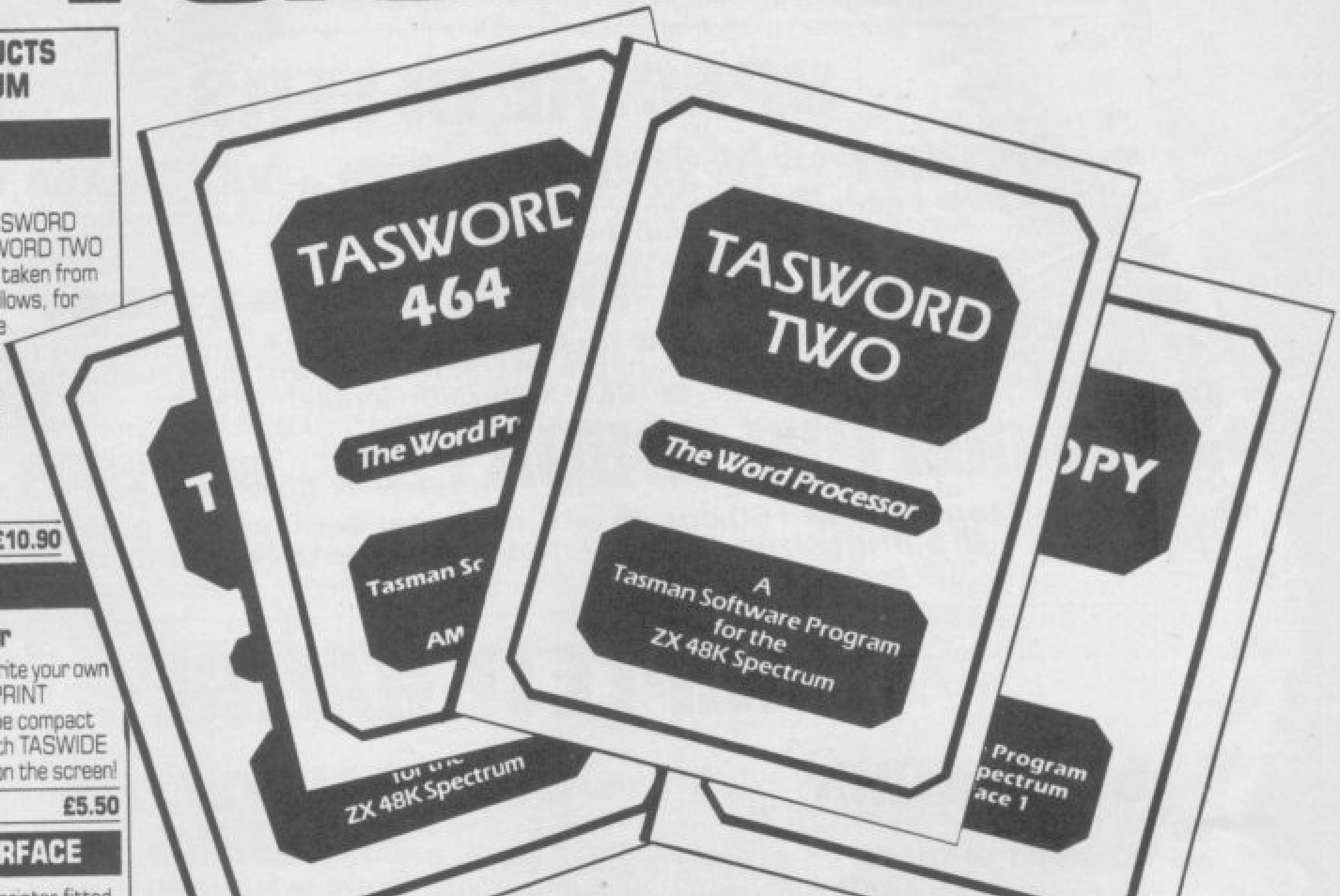
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CENTRONICS INTERFACE ZX Spectrum **£39.90**

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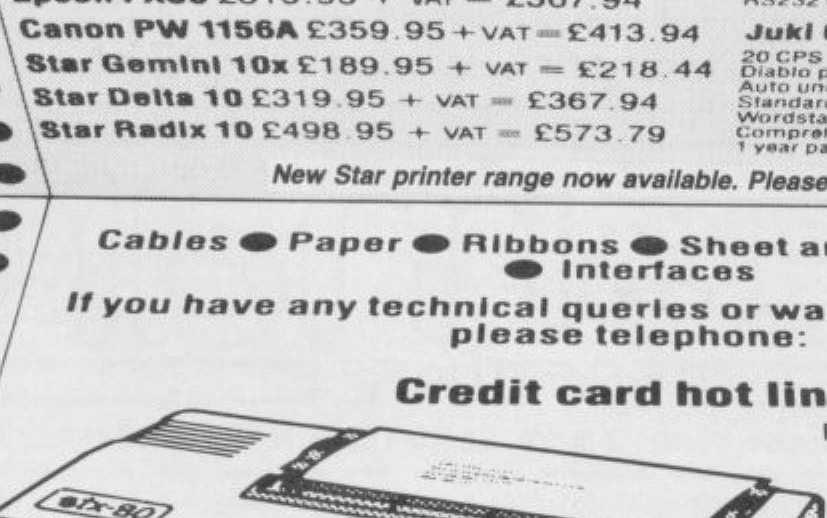
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The world is your lobster

THE MAN himself was there at the launch of **Minder**, the DK'tronics/ Thames TV spinoff. **Arthur Daley** spent much of the time smoking cigars and munching biscuits, however. Programmer **Don Priestley** did most of the talking.

That clearly worried the DK'tronics heavies, who lacked confidence in the garrulous pensioner. The minders stood at the back making signs to Priestley, in an attempt to guide his replies.

In any case the black box fatties needn't have worried. Most of the questions were bawled out by an imposing female from the *Daily Mirror*. "Everyone knows you have to get a game into the arcades to make any money," she insisted, asking if **Minder** was "the new Pac Man." "Is it a battle game or what?" ranted this refugee from a Surrey gymkhana. Nice to know the *Daily Maxwell* still has a finger on the pulse of Britain . . .

DK vendetta

Meanwhile, **DK'tronics** is suffering from the attentions of an ex-employee with a grudge. The character has been sending out press releases on photocopied DK'tronics notepaper delving into owner **David Heelas'** private life.

Without going into the gory and irrelevant details, it appears David made a court appearance recently at which he announced he was selling the company and moving to Great Yarmouth. Not so, according to **DK**. Which leaves Gremlin pondering two questions. Who is penning the poisonous press releases, and why did Heelas tell a court he was selling up if he wasn't . ?

Garbo on the Mersey

Software Projects superstar **Matthew Smith** is 'resting', according to his boss **Alan Maton**. The flabby maestro of animated toilets is distressed by the attention of the media and only vants to be alone . . .

Rivers of blood

Meanwhile, **Maton** is scouring Liverpool for someone to throttle. He's convinced a fellow Merseysider is behind rumours that Software Projects is going bust. "I'll punch him in the head, I'll *@#!¿£ kick his teeth in, I'll . . ." Words fail Alan as visions of blood-soaked slaughter fill his brain . . .

MP Bob Dunne does chair company Balans a good turn by obscuring their new product with his immense bulk. The awful truth about the Blans Vital computer chair is revealed in the inset.





Bill 'incorruptible' Scolding accepts money from Arthur Daley in return for putting him on the front cover. Note the grubby corduroys.

The wrath of Buzby

Incensed by a derogatory news item about **Gyron** in a rival comic, creators **Firebird** promptly threatened to withdraw 10 grand's worth of advertising if the subsequent review spat similar vitriol.

The rag in question, a slim publication catering mainly for the headbanger market, now features no review at all. . .

Kid's stuff

Brazen Backslappers of the Month Award goes to **Elite** for emphasising the extreme youth of the company. There are several extreme youths at Elite, and sales director **Steve Wilcox** reckons it means Elite is "meeting the needs of a young market – average age 10 to 15."

A long list of games is included, such as **Grand National** and **Dukes of Hazzard**. The one the Wilcox clan omits is **911TS**, an incredibly dull plug for Dunlop Tyres. Word from the kindergarten suggests the little lads are unhappy about the game. "Definitely the last of a breed," says one pre-pubescent mole . . .

Nuking US Gold

CND is worried about games like **Raid Over Moscow** where zapping aliens is discarded for the joys of nuking the reds.

Gremlin cherishes the comments of **US Gold's Geoff Brown**, who brought the venomous game to our shores. "A well-adjusted child is able to differentiate fantasy from reality," he says. Quite. It's not the kids who worry us, it's what happens when they grow up and turn into Ronald Reagan . . .

Political virgin

Nick Alexander of **Virgin** is also getting into politics. 32-year-old Nick has been co-opted to advise **David Owen** of the **SDP** about the interests of youth. Nick is a proud founder member of the SDP and reckons his experience flogging records and **Sheepwalk** to kids will stand Dr Owen in good stead. The facts speak for themselves, really . . .

Old buffer complains

And finally **Mike Howard** of **Buffer Micro** (RIP) writes elsewhere to protest about Gremlin's hairy armpits story last month. Since the sexist comments were taken from an article written under his name in a trade paper, it seems odd.

According to Howard, the *Computer Trade Weekly* gang made it all up, and then read bits of it to him over the phone. "If Howard wanted any of it changed he could have said so," wails cub reporter Simon Harvey at CTW. "I did," says Howard. "They wanted to make a crack about Greenham Common, and I said no. So they put in hairy armpits instead, which was even worse."

CTW says that it has a duty to report the industry 'warts and all'. And if you can't find any warts, invent them, supposes Gremlin . . .

Praise Clive!

I AM surprised that you bothered to print the letter from Dietmar Osman regarding Sir Clive Sinclair – letters, April.

Sinclair was the innovator of the hand-held calculator and the home computer.

The Spectrum was an enormous step in this field. The potential of this machine as a serious mathematical and scientific tool can hardly be appreciated by those people who use it for games only. The microdrives on my machines have, after a year of daily use, proved perfectly reliable.

The QL is a further step to serious computing and will accommodate a larger range of useage than most home machines.

One would not expect the writer of such a letter to understand the importance in transport engineering terms of the C5 tricycle and its attempt to establish at least one new thought pattern in social transport.

If Dietmar Osman would enter Sir Clive's dreamworld perhaps he too could become a multi-millionaire.

J Talbot,
King's Lynn, Norfolk

I WISH to reply briefly to Mr Osman of Farnham, Surrey who claims that Sir Clive 'is rapidly going downhill' and criticises the QL, the microdrives, the Spectrum Plus, and the C5 which he considers to be 'Clive's latest idiocy'.

Whether the C5 is a death trap or not remains to be proved, but if it is unfit for the road, the country's lack of cycle paths has something to do with it. I can only praise Sir Clive's spirit and I hope his dream of 'fast, quiet, astonishing family vehicles' comes true.

If it hadn't been for Sir Clive, there might never have been a British computer industry. So, to save the country from crumbling any further, why don't we encourage geniuses like Sir Clive Sinclair to achieve their highly humanitarian goals?

He's all the once-famous British inventive spirit has to hold onto. Why can't the nation and the Government realise that?

J Paton,
Geneva, Switzerland

Easy random formulae

SIMON North — Letters, April — was nearly right. Any experienced user will notice that the Spectrum will evaluate RND * b before subtracting a. The formula should be capable of being used in a program with values being substituted.

The correct way to write his formula is

INT(RND *(b-a)) + a

Far better to say

INT (RND * L) + start

where 'start' is the start of the range, and 'L', one more than the length of the range. So, to give a random number between 10 and 20, the formula would read

INT (RND * 11) + 10

Stephen Hutton,
Preston, Lancashire

Entry Points in correction

GLANCING through Entry Point in April's *Sinclair User* I was surprised to see stated 'numeric variable names have the same length restriction as that of strings'. Actually, this restriction applies to numeric arrays, not numeric variables.

In fact, it can be helpful to use mnemonic multi-character variable names while programming, replacing them with shorter names when the program is working.

The statement, further on, that 'ROM is similar to RAM but anything which you store in it will not disappear when you switch off the power' implies that the contents of ROM can be altered; which is not so.

John Foad,
Nottinghamshire

Embarrassing front covers

I KNOW you try to appeal to a wide audience but if your cover pictures are anything to go by you are only appealing to schoolchildren.

I like your magazine but pictures of turtles, schoolteachers and certain characters on the front tend to make me feel embarrassed about buying it. I usually pick a time when the newsagent is nearly empty and I hurriedly hide it between the covers of the *Sun* newspaper.

A Wilson,
Arbroath, Angus

PS. Please don't tell anyone I read the *Sun*.

● *Oops! Sorry. I'm intrigued by 'certain characters', though. Could you mean Sir Clive? Ed.*

Indignant at hairy story

IT SEEMS that Gremlin has got his knickers in a twist — *Sinclair User*, May — by ignoring the first rule of journalism — check your facts before publishing.

Just for the record, I have never been discourteous to, or thrown out, any woman customer from the Buffer Shop and the question of hairy armpits has never even crossed my mind. This whole silly story derives from the imagination of a *Computer Trade Weekly* reporter trying to write a humorous article about retail shops.

What a pity that the schoolboy who writes the Gremlin page did not notice that this magazine appeared during the week of April 1!

M Howard,
Buffer Micro,
London SW16

● *CTW claims that the story, published under Mike Howard's name, was cleared with him prior to publication.*

In view of Buffer's recent demise perhaps we should be generous and give Howard the benefit of the doubt. Ed.

Penpals are required

WE WOULD like to have some penfriends to swap hints, tips and games for the Spectrum 48K.

Eirikur Gudmundsson,
Ogmundur Kristjansson,
Rettaeholt 5,
800 Selfoss,
Iceland

MY sons — Milan, 15, and David, 14, and I would like to take up correspondence and exchange programs with British Spectrum users very much.

Milan Stola,
PO Box 48,
66902 Znojmo,
Czechoslovakia

Fonts changed

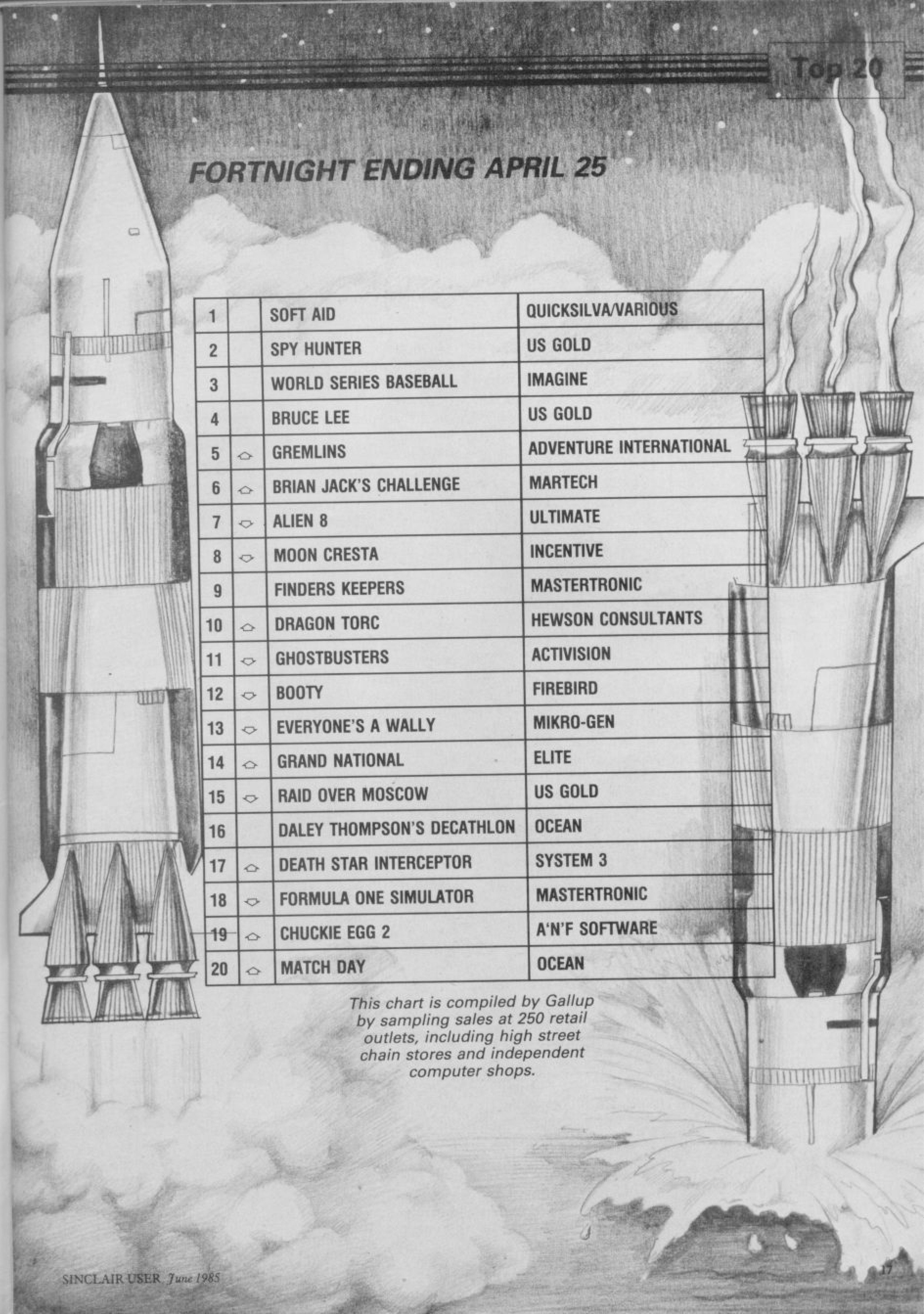
I read with interest your review of the **JASPRINT** program in the April issue of SINCLAIR USER. Unfortunately your reviewer has made an error in his review. He states that when using **JASPRINT** within TASWORD 2 the fonts cannot be changed in the middle of a line. That statement is <u>incorrect</u> as this letter shows.

The Jasprint manual states that the tilde character initiates the Jasprint style printing from the start of the next line. Once Jasprint has been initiated the fonts can be changed as and when required. A further tilde character will then cause the print to revert to normal.

P. FARRAR
FULFORD
YORK

continued on page 18


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1		SOFT AID	QUICKSILVA/VARIOUS
2		SPY HUNTER	US GOLD
3		WORLD SERIES BASEBALL	IMAGINE
4		BRUCE LEE	US GOLD
5	▲	GREMLINS	ADVENTURE INTERNATIONAL
6	▲	BRIAN JACK'S CHALLENGE	MARTECH
7	▼	ALIEN 8	ULTIMATE
8	▼	MOON CRESTA	INCENTIVE
9		FINDERS KEEPERS	MASTERTRONIC
10	▲	DRAGON TORC	HEWSON CONSULTANTS
11	▼	GHOSTBUSTERS	ACTIVISION
12	▼	BOOTY	FIREBIRD
13	▼	EVERYONE'S A WALLY	MIKRO-GEN
14	▲	GRAND NATIONAL	ELITE
15	▼	RAID OVER MOSCOW	US GOLD
16		DALEY THOMPSON'S DECATHLON	OCEAN
17	▲	DEATH STAR INTERCEPTOR	SYSTEM 3
18	▼	FORMULA ONE SIMULATOR	MASTERTRONIC
19	▲	CHUCKIE EGG 2	A'N'F SOFTWARE
20	▲	MATCH DAY	OCEAN

This chart is compiled by Gallup by sampling sales at 250 retail outlets, including high street chain stores and independent computer shops.

Ted tipped off

I READ in May's *Sinclair User* that a certain Mrs Diff Usion was having a little trouble with **Technician Ted**.

Having popped into reception after that tricky job in the Silicon Slice store, Ted finds himself next to a fire extinguisher which some fool has let off, so he needs to somehow get to the ground. That done, he goes to hang up his jacket — after all, it's hot in the furnaces.

It's a risky job that he's about to do, so he makes a photocopy of his will, and takes it through to the Boardroom, which is underneath reception. However, in the Boardroom by the entrance to the furnaces — "Who built this place?", Ted wonders — there is a nasty executive who won't let him through.

Undaunted, Ted sees another way around and, waiting until a Bluebottle flies behind him, he jumps up on the foremost chair, then takes a running jump off the edge, avoiding the insect as it flies beneath his legs.

His body tucked well into the ladder, Ted twice jumps up and readies himself for the jump across the gap. Once that is completed, there is only the door between him and his goal, though what happens after that I have no idea.

R Miles,
Broadstone, Dorest

Aliens which never die

FOR THOSE who are having problems with **Alien 8** I have a poke which gives you infinite lives and enables you to last a light year.

```
10 LET tot=0: FOR n=50000 TO 50089: READ a: LET tot=tot+a: POKE n,a: NEXT n
20 IF tot<>10530 THEN PRINT "ERROR IN DATA": STOP
25 STOP
30 PRINT AT 10,10; "INSERT TAPE": RANDOMIZE USR 50000
100 DATA 62, 255, 55, 17, 141, 5, 221, 33, 203, 92, 20, 8, 21, 243, 62, 15, 211, 254, 205, 98, 5, 48, 233, 33, 86, 176, 34, 233, 96, 33, 157, 195, 17, 28, 238, 1, 200, 0, 237, 176, 243, 237, 94, 33, 41, 236, 229, 33, 137, 97, 229, 51, 51, 17, 41, 236, 1, 242, 1, 33, 253, 94, 253, 33, 239, 96, 221, 33, 184, 98, 62, 200, 237, 79, 195, 137, 97, 62, 0, 50, 24, 202, 62, 201, 50, 172, 173
110 DATA 195, 0, 99
```

After typing in the program press RUN.

After running it you should get a 'STOP statement' message. If you get 'ERROR IN DATA' go back and check your data. If all's well, you can now take out line 25 and SAVE the program — next time you use it you can just run it.

Then enter 'GOTO 30' and put your fully rewound **Alien 8** tape in the cassette recorder and press PLAY.

Daniel Rose,
Tonbridge, Kent

Eyecatching high score

I CLAIM to be the Supreme **Grand National** King. I first finished the race on April 3. I have recently scored, after 28 career years, £999999, and 280 points with no fines or bans.

Most of my wins were on Eyecatcher.

Jon Rose,
aged 14,
Wallington, Surrey

The hidden message

SOME POKES for a few games. On **Cavelon,** instead of holding down all the keys for a "Hi Chris . . ." message, how about typing in "J S Willy"?

On **Moon Alert,** POKE 42404,255 will give 100 lives. Fans of golden oldie **Horace Goes Skiing** will be glad to hear that POKE 29270,0 removes traffic from the road.

Finally, anyone having trouble with **Sabre Wulf?** POKE 44685,186; POKE 44676,255 and POKE 44677,80 will give Sabreman invincibility and keep him cyan.

Can anyone supply me with endless lives POKES for **Technician Ted?**

Derek Ribeirio,
aged 13,
Cheshunt,
Hertfordshire.

Cheating tips for Willy fans

HERE are some more pokes for **Jet Set Willy.**

MERGE the short loader program, stop the tape when loaded, insert the pokes you want into a new line 35, then run and start the tape again.

POKE 38240,0 — removes all moving objects; POKE 36477,1 — stops death when falling; POKE 37982,0 — allows you to walk through nasties; POKE 35899,0 — infinite lives; POKE 35123,0 — disable any moving object; POKE 38207,0 — disable Maria; POKE 36545,0 — banyan tree easier; POKE 36358,0 — extra zip when jumping.

Paul McCartan,
Chinnor,
Oxfordshire.

Lion and the wardrobe lift

I WOULD like to know if I am the first to complete **Wizard's Lair.** I completed it on April 13 at 8.10.

When you have found three bits of the golden lion either find a magic lift or a wardrobe lift and go to the lion's level.

Once there go to the right-hand door, go over the lion and go down. Turn right and get the yellow cross. Once you have picked that up go back over the lion and go up.

When you have found the fourth part of the lion fall down a hole. Then find a lift and return to the lion's level. Go over the lion to the right-hand door. Keep going right until you escape.

Paul Berryman,
Cambourne,
Cornwall.

Short cut to Kokotoni Wilf

KOKOTONI WILF is probably one of my favourite games and I know codes to reach the second and third time zones.

At the start, when the title screen is displayed, press 2 to enter time zone two (1066) or press 3 to enter time zone three (1467). It is not possible to reach the later time zones by the same method.

Simon Evans,
aged 12,
Clevedon, Avon.

Bruce leaps to Norway

I HAVE finished **Bruce Lee** 16 times, with a high score of 1,022,625.

Ingar Fuglevaag,
Angvik,
Norway.

High scores on the beach

I HAVE a personal high score of 7,640,700 on **Hunchback,** by Ocean. This took two hours.

I finished **Beach-Head** from US Gold on December 6 with a score of 132,500.

I finished **Ghostbusters** on December 16. Since then I have pushed my account to $450,000.

Rik Davey,
Urmston,
Manchester.

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U.S. GOLD

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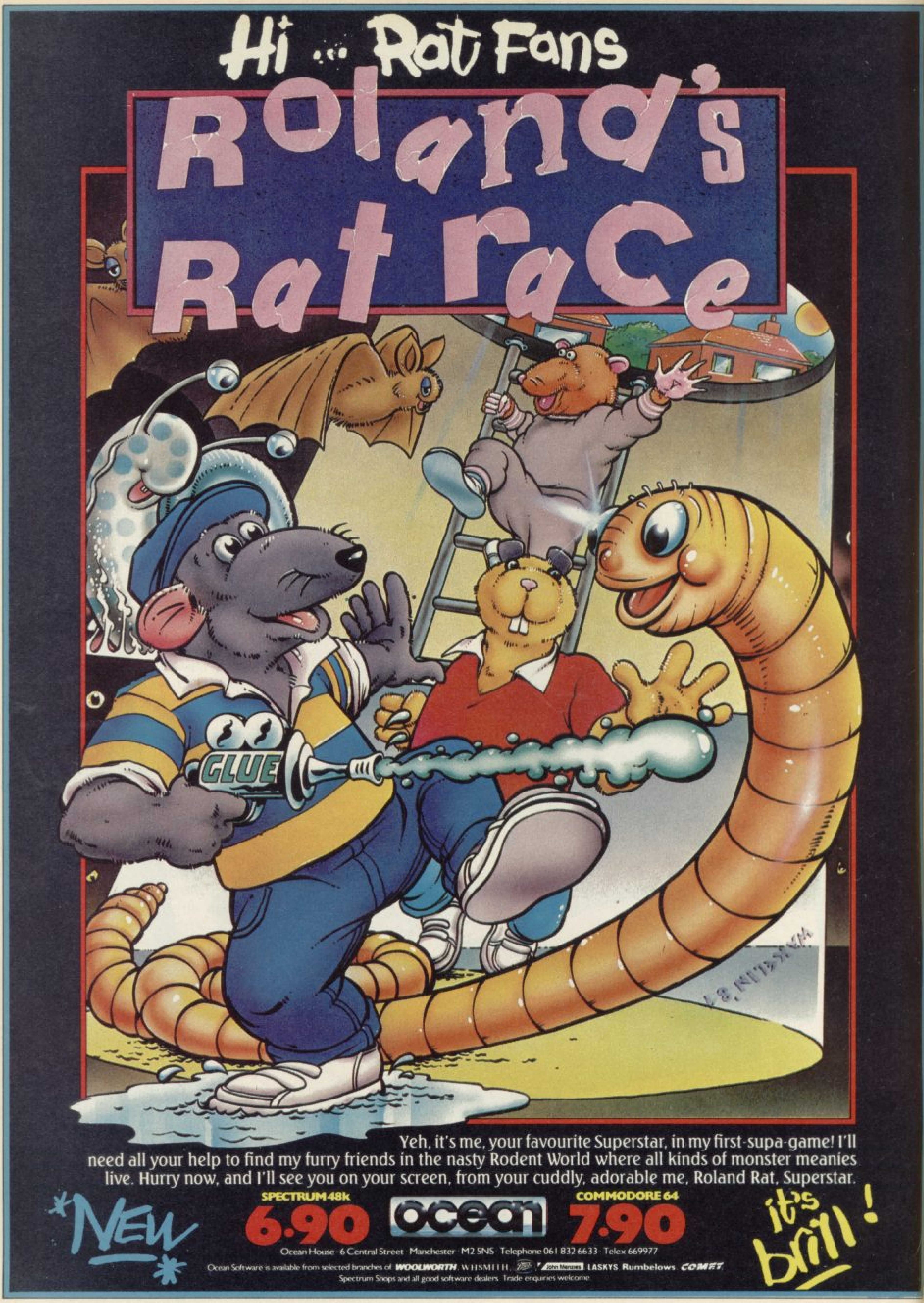
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SINCLAIR USER Classics are programs which, in our biased and eccentric opinion, set new standards in software. They are the programs by which the others should be measured. If you buy no other software, buy these. No self-respecting Sinclair user should be without them.

Software reviews carry a star rating, the basis of which will be value for money. Programming, graphics, speed, presentation, addictive qualities and the rest are taken into account.

Guide to ratings
★★★★★ 24 carat. Buy it
★★★★ Value for money
★★★ Nothing special
★★ Over-priced
★ A rip-off

Minder

WHO needs 30 packs of pure gold acupuncture needles? Hookey stuff, without a doubt, but that won't stop you from making a deal in **Minder,** based on the hit TV series.

Minder puts you in Arthur's shoes with a two grand stake and a fortnight to get rich. Visit the Winchester Club to make the contacts you'll need to buy your stock, or have a chat with proprietor Dave about the doings of the Old Bill, in the person of mean, moody, Inspector Chisholm.

When you've bought the goods you want, you'll have to try and sell them to one of the many shady dealers in the manor. If they're bent, Chisholm will be after you. And there's always the aggravation of trying to get hold of Terry to do the fetching and carrying. True to form, all Arthur ever does is count the money.

The game is played out through conversations with the many characters. There are up to 35,000, identified by an identikit style of graphics to build up their faces. You can use Arthur's own brand of cockney most of the time; the program recognises



much slang, although at times you have to use a specific phrase to clinch a deal. You can also play a more devious game, selling goods you don't own and then trying to pick them up cheaply before time runs out to make a killing.

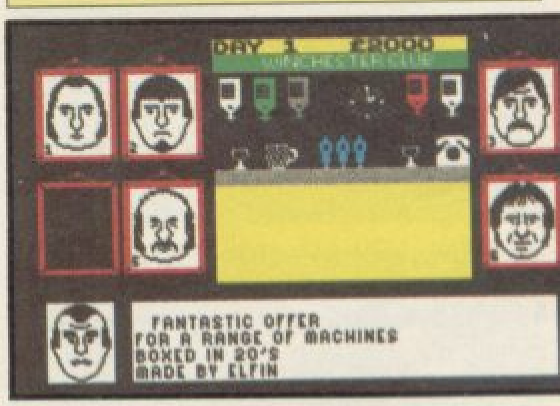
It's all great fun and very much like the TV show, except in so far as Terry's life as a minder, with all the violence and confusion, is barely mentioned. Unfortunately the game is marred by the occasional bug in the interpreter, so that conversations can go off the rails, with words missed out or the wrong prices agreed on.

That tends to destroy the illusion and show up the program as rather more simple than it appears when things function properly. However, you will never get the old 'I don't understand' comments.

There is plenty of humour, particularly in the extraordinary goods you will have to buy and sell. Chisholm can be a right pain at times, and you may have to cut your losses and dump bent stock to avoid being hassled on other deals. But the roots of **Minder** are still those of a fairly simple trading game, and although it may sustain itself for a while, it will ultimately become boring to play.

In all fairness, **Minder** could have been done extremely badly indeed, and to the credit of DK'tronics and Thames TV it is not at all bad. Just a bit more care at the final stages, with a touch more variety and depth to the conversations, and it could have been a classic. *Chris Bourne*

Publisher DK'tronics **Price** £9.95
Memory 48K
★★★★



Cats

MEET Deuteronomy, leader of the Jellicle cats in T S Eliot's poems and Andrew Lloyd Wallet's musical.

The cats' enemies, the Pollicle dogs, have hidden an object known, for some reason, as the Heavyside Layer. It is the focus of the cats mystic powers, and the dogs intend to destroy it — if they can form a pack. Meanwhile ten kittens have strayed off the astral staircase and must be collected and returned to the Heavyside Layer.



The whole heady brew of witchcraft and whiskers boils down to a basic **Sabre Wulf** style maze game. The playing area is very large, and a map is provided which can be consulted at will. The map shows the positions of dogs and kittens, thus enabling you to work out the best routes. Deuteronomy deals death in the form of fur-balls and carries stun powder.

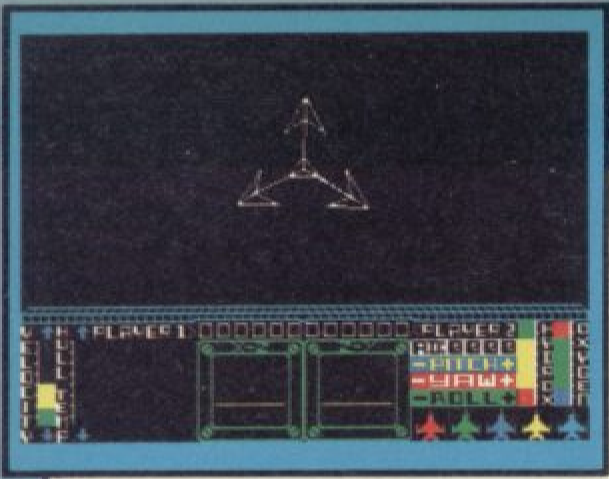
The graphics are well-designed and attractive. The animation tends to be slow, particularly if you want to keep the sound effects, a wailing rendition of *Memory*.

Cats would be a sweet little number full of fun and novelty if it was not for one thing — the game is too easy. It was a good idea to allow sight of the map, but a time limit on that might be appropriate. Deuteronomy starts off with too many stamina points so that, with the obligatory nine lives, he can easily afford to die and come back with a full complement of strength.

When 24 dogs are in the den the pack is formed and you lose. Again, even at the highest level, using a couple of lives to exterminate dogs should even the odds sufficiently to give you time to complete your task. We managed to play straight through all five levels for a grand total of 7953025 points. No game ought to be that easy, surely? *Chris Bourne*

Publisher Artic **Price** £6.95
Memory 48K **Joystick** Kempston, Sinclair, Cursor
★★★

more software on page 22



Starion

BATTLING with aliens in space to gain a jumble of alphabetical letters is an odd but original theme. Melbourne House has come up trumps with **Starion** where your powers at sorting out anagrams will be called to the fore.

Starion constitutes a series of word puzzles and anagrams and is a fine mixture of arcade style graphics combined with strategy and superb 3D effects. A good general knowledge of history and spelling is essential.

The idea is to re-write 243 events in earth's history over the last few hundred years. Killing off enemy space craft causes them to drop letters which when collected form a word — though you have to unscramble it first to make sense. That word will change one event in history but it is up to you to choose the correct era.

The game is divided into time grids and time zones grouped in blocks of nine. In each zone, the letters have to be collected and a word formed to enable you to fly through the time warp — very tricky as its centre never remains still. Once through you reach the time grid, which allows you to choose the year to which your wordy cargo belongs and to head straight for Earth. If the word fits, you will then have to repeat the process in the remaining eight zones.

After re-writing history in all nine zones battle recommences taking you to a further eight time grids in the next block.

The screen shows the view outside the cockpit with your laser guns' cross hairs firmly centred in the middle. Aliens and flying debris hurtle towards you at great speeds giving the impression of flying forwards. It is no mean feat to hit the aliens due to their speed and erratic movement. Debris should be dodged to avoid damage to the craft.

At the bottom of the screen is the instrument panel displaying speed, the letters collected and two radar scanners which scan both horizontal and vertical fields.

When picking up the letters, lock them into the centre of the cross-hairs and fly forwards. One gripe is the length of time it takes for the letter to travel towards you, although it can be appreciated that the letter has to be redrawn continuously at it gets larger.

Starion can be viewed either as a light educational adventure in time or purely as an arcade game. Whatever view, it's well worth buying if only for the pleasure of turning history upside down.

Clare Edgeley

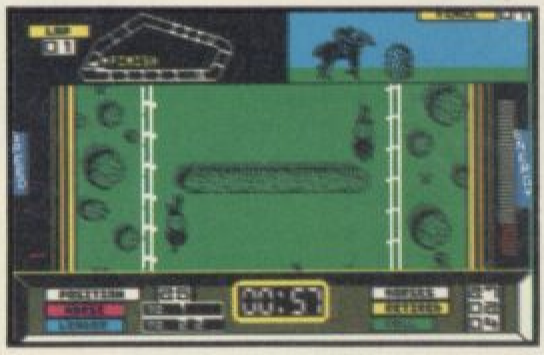
Publisher Melbourne House
Price £7.95 **Memory** 48K
Joystick Kempston, Sinclair
★★★★

Grand National

AFICIONADOS of the turf will doubtless be queueing up for the latest Elite game, **Grand National**. If, however, you are seeking quick and easy reparations for your failure to back *Last Suspect* a few weeks ago, forget it.

The game is part simulation, part arcade in style. The first section involves choosing a mount for the race. You are offered a selection from the field, and information for the condition of the course.

Then it is into the arcade section for



the race itself. An overhead view of the course shows other horses attempting to get into position. A further screen in the corner shows a view of the horse from the side, to enable you to judge the jumps as they come. That is the difficult part. You have to jump at just the right point to clear the fence, and must have built up a fair speed through constant use of the whip.

The graphics are a little lacklustre and the excellent animation does mean the horses, although realistic, move somewhat slowly. More of an amble than a gallop, one might say. The frustration of falling off your horse at the first fence 25 times in a row is off-putting, but you will eventually find it possible to complete at least one lap before your nag finally flops to the ground in total exhaustion. *Chris Bourne*

Publisher Elite **Price** £6.95
Memory 48K
★★★★

Body Works

JONATHAN Millar has popped up again, following his success with the TV series *The Body in Question* last year and has produced **Body Works** with Genesis Productions — a program which shows in clear and illustrated detail various functions of the body.

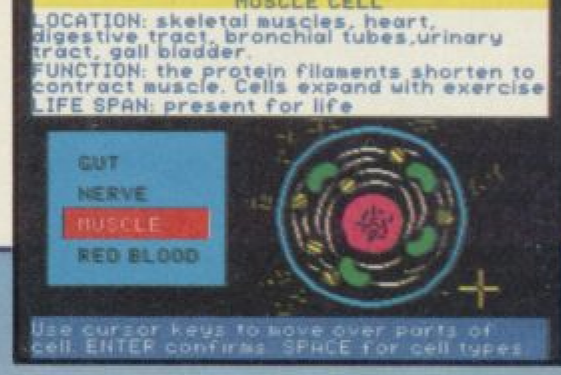
Cells, respiration, digestion, muscles, nerves, circulation are all detailed and a marathon simulation ties the whole program together showing how each functions under stress.

So, if you have an overwhelming desire to know how nerves transmit messages to the brain — load it, sit back, look and learn. Each function is graphically illustrated for you and, as for straining yourself, all you have to do is press the space bar occasionally to move to the next stage.

There are two cassettes, a poster and booklet describing each process in the package, which probably accounts for the high price. The programs for each function are very short and slow. If the message takes as long to get to the brain as it does on the program, you would be dead long before it got there.

Clare Edgeley

Publisher Genesis Productions
Price £14.95 **Memory** 48K
★★



Shadowfire

TEXT adventures may soon become a thing of the past if Beyond Software has its way.

Shadowfire is an icon-driven strategic adventure — the first ever on the Spectrum — where commands are issued through pictures and text is obsolete.

You join Enigma — a fierce and independent fighting force — whose mission is to storm the planet Zoff V and free Ambassador Kryxix. Once on Zoff V, Enigma has to search through the maze of corridors, fighting General Zoff's guards, locate the ambassador and transport him to safety.

Each member of the team is controlled individually — Zark, Syylk, Sevrina, Torik, Maul and Manto and each has its own skills, strengths and weaknesses. Those will need to be co-ordinated and decisions made accordingly. Sevrina is a lock picker and her skills will be needed on Zoff V — therefore she should be given a tool kit from the weapons screen.

You start with a screen depicting all six characters, each portrayed in a different colour to help identification — although on this first screen the graphics are so clear that each is instantly recognisable. Having selected the character you want to move with a cursor, you then switch to the weapons screen to equip each with some mind blowing secret weapon.



The icons are many and varied. Each has a separate function and is selected with a scrolling cursor. Move the cursor to the function you want a character to perform — pick up — then along to a laser gun; press enter and that character will receive that weapon.

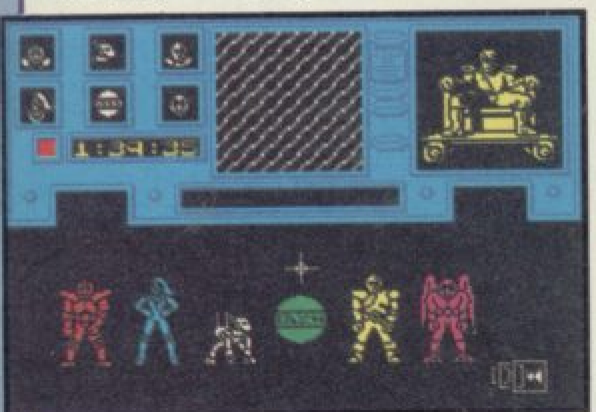
Each order is performed in a similar manner throughout the game. Some confusion may arise as certain pictures are not clear. However, referring to the comprehensive illustrated booklet should solve any such problems.

SINCLAIR USER CLASSIC



The graphics deserve a mention. For the most part, they are clearly depicted and colourful though, unfortunately, their small size tends to make definition hard. Each screen is divided into a number of boxes, all containing control icons. The screen showing Zoff V and your route to Kryxix is amost lost in the top middle section. It is a pity that this space has been sacrificed to give more attention to the controls.

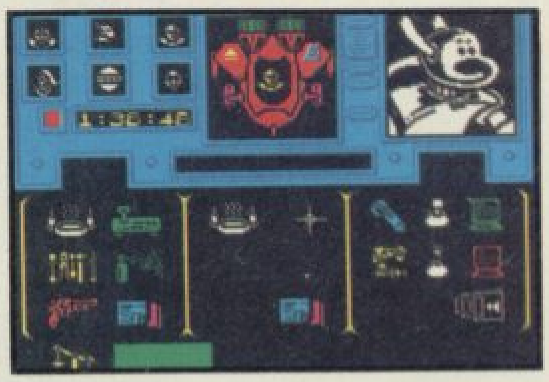
You are given 100 minutes to complete Shadowfire and a real time clock ticks away the seconds. However it will take considerably longer to learn the game, especially if you keep breaking out of it by mistake. It is very easy to exit by accident. Accidental pressure on Enter when you go back to choose another character will take you straight back to the menu. It always seems to happen at some vital point of the game and is enough to turn you to drink.



Shadowfire is excellent value considering the programming expertise which has gone into the game. If you want a quick load-it-up and shoot-it -down then don't waste your money. However, if you want a fast and innovative game which may well take weeks to complete — buy it.

Clare Edgeley

Publisher Beyond **Price** £9.95
Memory 48K **Joystick** Sinclair, Kempston, Protek
★★★★★



Varitalk

AFTER ALL those crashes and programming problems the last thing you may want to do is to make your Spectrum talk, but that is possible with **Varitalk** from ITS Software.

It works in a similar way to that old hardware warhorse, the Currah Speech Unit, but it is all done with software. The program is user-transparent — in other words you cannot see any results unless you do some hard work — and gives the Spectrum a library of 52 phonetically encoded sounds. A list of those codes is given on the instruction inlay.

The codes are easy to decipher. You type in a two-figure code, which represents a sound, into your Basic program. If you want a specific 'A' sound you would look at the section of codes beginning with 'A'. Each section has six types of sound. If you needed that 'A' to sound like the 'A' which is in FAR you would find that type of sound — FAR — is third on the 'A' list making the code A3.

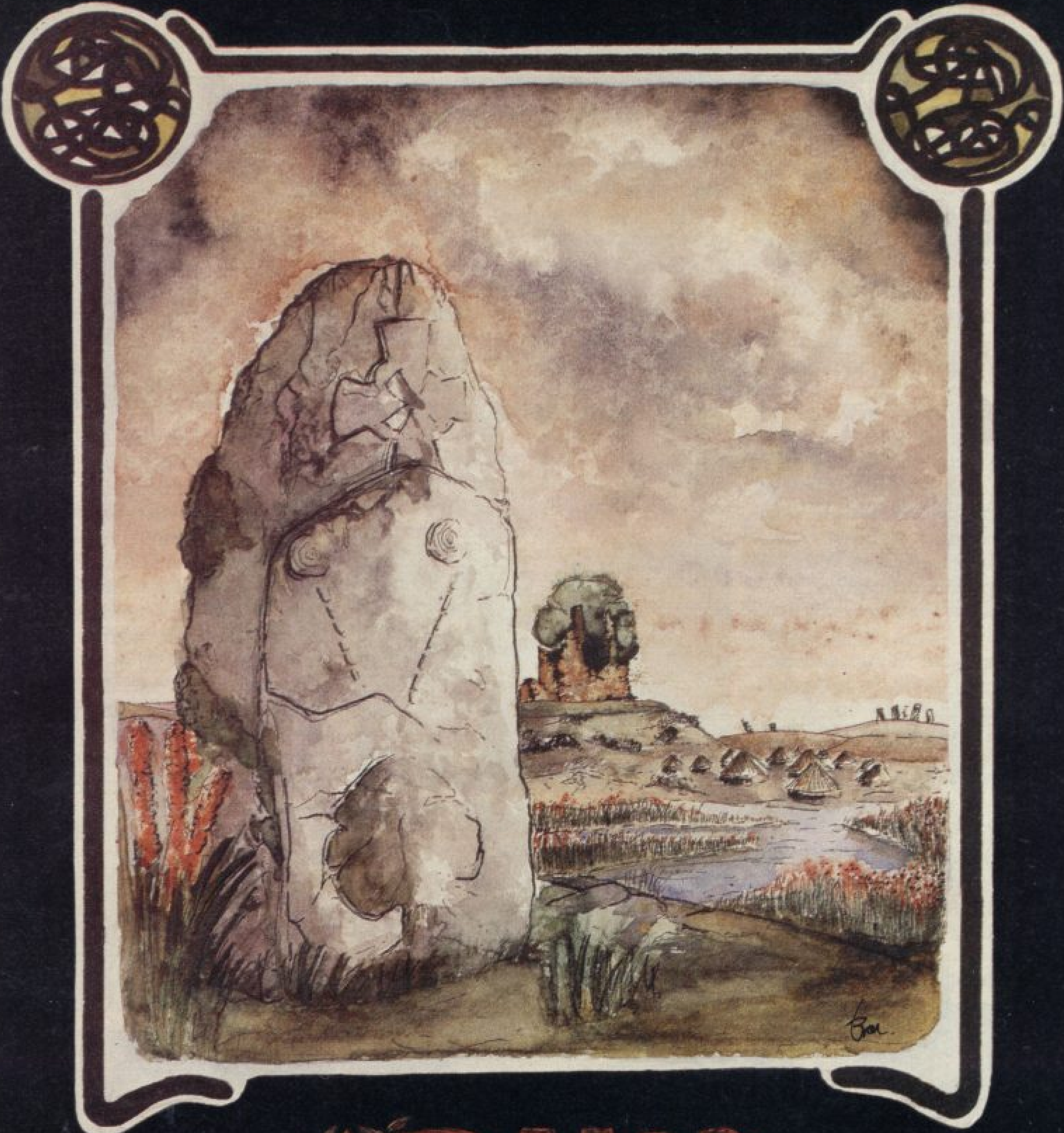
Next you can put the codes into a special variable T$ and make one machine code call which enables the Spectrum to pronounce your message. For instance, 'TALK' requires the code 'T1A6H2K1'.

Varitalk is an excellent toy and we had a lot of fun playing with it. Unfortunately, all those codes can be a put off.

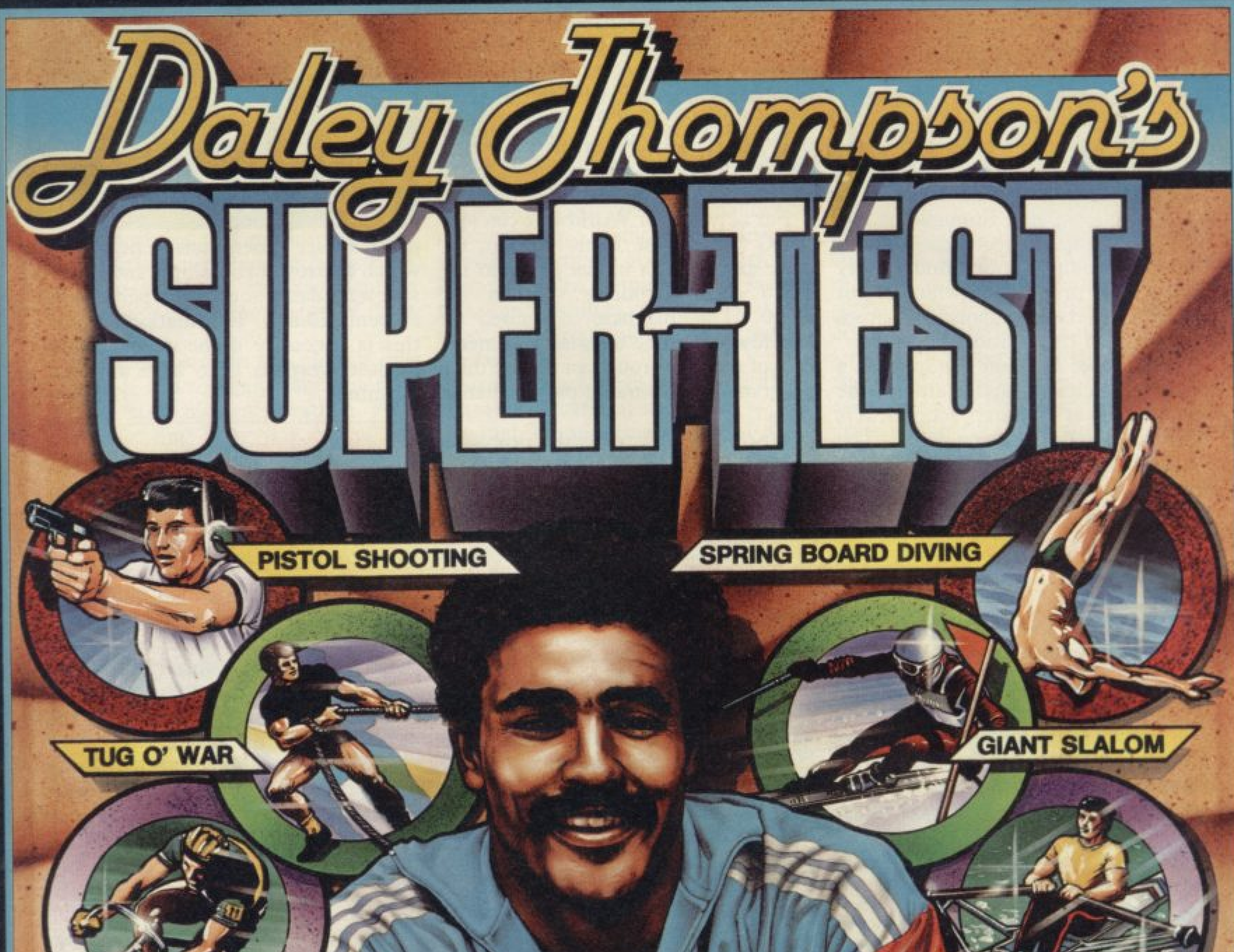
John Gilbert

Publisher ITS Software **Price** £5.00
Memory 48K
★★★

more software on page 26



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Worldwise: Nuclear Weapons

MENTION Peace Studies in some quarters and the reaction is likely to be paranoid with accusations of left wing indoctrination flying through the air. This is a shame because peace studies can help young people find a way through the propaganda which is put out by all sorts of organisations from both sides of the political spectrum.

Worldwise: Nuclear Weapons is a study of nuclear weapons around the world aimed at secondary schools. It is informative without being biased. The program is based on an atlas of the world and countries can be chosen and magnified if desired. Lists of each country's nuclear capabilities together with fire power are shown and positioned on a map. After students have familiarised themselves with the maps and weaponry, they can play simulation games aimed at arms reduction and gradually remove weapons from the map.

For £2, users of **Worldwise** can join WUG (Worldwise Users Group), receive extra copies of the program for £2.50 and microdrive versions for £4.00. The database contained in **Worldwise** will be updated and members of the user group can update their programs at favourable part exchange rates.

Worldwise illustrates the problems surrounding arms negotiations, and above all the frightening amount of weaponry which exists to kill and maim future generations. The bombs which destroyed Hiroshima and Nagasaki were damp squibs compared with current arsenals. Information such as this is necessary if the debate about nuclear weapons is to have any real meaning.

Theo Wood



Publisher Richardson Institute for Conflict and Peace Research
Price £6.00 **Memory** 48K
★★★★★

Brian Jacks' Challenge

A NAKED ATTEMPT to cash in on the popularity of **Daley Thompsons Decathlon**, **Brian Jacks' Superstar Challenge** pits your joystick-powered body against he-man Brian Jacks in eight events drawn from the TV sports series in which athletes compete at a range of sports.



Each side of the tape contains four events. Those divide into two types. There are the ones like canoeing or cycling where you have to pump the joystick left and right as hard as you can, and there are others like archery or squat thrusts where skill at judging when to fire or change direction is paramount.

The animation is poor and only occupies a small part of the screen. The races are particularly disappointing as the competitors barely move at all and stay in the centre of the screen.

The football event where you must dribble round four cones and then shoot at a goalkeeper we found unplayable and totally unrealistic. The other events bear some relation to their originals, but squat thrusts and arm dips are not the most exciting of activities to watch or perform, in the sweaty flesh or on screen.

It is fairly easy to beat Brian on the early levels of the game, and doubtful whether many would wish to continue to higher levels to receive their thrashing. You'll have more fun drinking glucose and pumping iron all day.

Chris Bourne

Publisher Martech **Price** £7.95
Memory 48K **Joystick** Sinclair, Kempston
★★

Komplex

IS LEGEND taking its revenge on the computer press for its opinions of the Great Space Hype? If so, it has the perfect weapon in **Komplex.**

To begin with, you have to plough through pages of miniscule and illegible instructions. The aim is to descend the many levels of an alien planet picking up the letters, K, O, M, P, L, E and X in order and storing them in a central computer.

Despite the title the game is simple. Target Sensors on your control panel turn from red to green as you approach a letter and pinpoint a telephone booth shaped object, called a Rack. Docking with the Rack releases the letter into your cargo hold.

Docking with Service Tubes takes you through a tunnel to the next level. In this phase you control a single laser shield to fend off approaching aliens. If your craft sustains too much damage you will be unable to pick up a letter on the next level.

Sound is minimal and the graphics are basic and wireframe, though good 3D and masking techniques are used.

All this makes for mundane and plodding entertainment, considerably less fun than the arcade oldie **Battlezone**, of which it is but a thinly disguised version.

It is, however, the optical effects which really put this game in a class of its own. The screen flashes red on and off continuously, as your ship is battered with a hail of laser fire. Headbangers might enjoy this rape of the eyeballs but, frankly, it gave me a headache.

Clare Edgeley

Publisher Legend **Price** £9.95
Memory 48K **Joystick** Sinclair, Kempston
★★



Wriggler

CRAWLING OUT from the dunghill of worthy utilities comes the Romantic Robot maggot. Romantic Robot has hitherto confined its activities to producing utilities and music programs, but its first arcade game demonstrates an appreciation of entertainment as well as a sound knowledge of byte lore.

Wriggler casts you as a maggot, big and white and squiggly, taking part in the four stage maggot marathon. First you must find your way out of the garden, then negotiate the scrubland, only to crawl underground into the tortuous labyrinth. Thence to the mansion itself and the final exit.

The game is essentially an extended maze, with plenty of confusing exits and entrances which defy the laws of normal map-making. On the way you must avoid or destroy the marauding denizens of the lawn. Particularly revolting are the giant deathshead spiders whose spindly legs inch along the corridors and paths with deliberate menace. Some of those monsters are relatively harmless in that they stick to known routes. Others such as the wasps and termites, zero in on you and soon digest your weak, white pulsating body.

Graphics are large — two or three character squares at minimum — and although the movement is slow, maggots do not exactly shift like the clappers themselves.

A piece of electronic muzak titled *Moons of Jupiter* is thrown in on the B-side of the cassette — definitely



music to squirm to. **Wriggler** represents a good few hours of fun. It contains plenty of humour and challenge in a rather different setting to the normal hi-tech or low-fantasy scenarios we have come to expect of arcade-adventure generally. *Chris Bourne*

Publisher Romantic Robot **Price** £5.95
Memory 48K **Joystick** Kempston, Sinclair
★★★★

World Series Baseball

NOT MANY people play baseball outside the States, but to judge from the fervour accorded the game there, it must be exciting. Imagine, newly resurrected under the paternal eye of Ocean's David Ward, has brought out a simulation as its first release with the new regime.

The name Imagine gives rise to all sorts of suspicions, but we were gratified to see that **World Series Baseball** is not at all bad. You can play the computer or a friend, and the screen shows a representation of the baseball diamond with crowds and a giant screen for advertising and scores.

With loving attention to baseball hype, the game opens with the American national anthem and cheerleaders. Then the stick-like figures of the teams come onto the pitch. Control is simple enough. If you are batting you can use the joystick to adjust the strength and lift of your swing, and to hit the ball.

The pitching team may set a close or open field, and then adjust the speed and direction of the pitched ball while in flight. Control is then passed to the fielder nearest the ball, and the race is on to see if the ball can be brought to a base before the batsman reaches it.

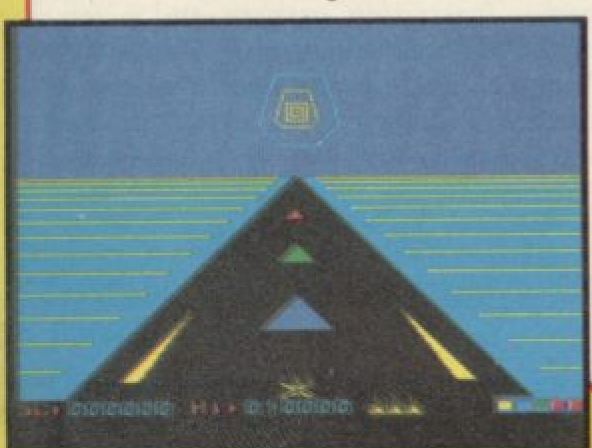
The scoreboard adds to the realism by showing genuine advertisements and humorous announcements in between innings, although the wait could become irritating if you have read them all before. Nevertheless, the game is fun and apparently realistic. Welcome back, Imagine. Keep up the good work. *Chris Bourne*

Publisher Imagine (1984) **Price** £6.95
Memory 48K **Joystick** Kempston, Sinclair, Cursor
★★★



Death Star Interceptor

THERE MUST be a better reason for being in the computing business than **Death Star Interceptor**. The addition of a strangled rasp of a voice in the take-off sequence and the splitting of a standard, wholly derivative shoot-em-up into three sections does not alter the fact that blasting alien spacecraft along the corridors of the giant space station is boring, boring, boring.



System 3 Software also bought the right to use the *Star Wars* theme on the game, where the thin story-line originated.

First you have to take off. When you hear the Spectrum talking to you the spacecraft is launched and you have to guide it through a small window into outer space.

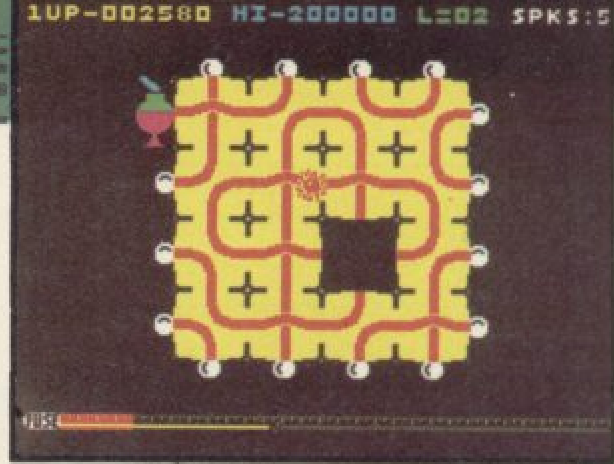
You get to see a picture of the earth receding and the death star approaching during the next section, but that is a mere visual bonus. The second stage is simply a matter of blasting or avoiding alien craft, which behave like stunted refugees from **Galaxians**. Once at the death star you get the time-honoured death-or-glory Luke 'make mine a milk shake' Skywalker run down the deadly corridor to plant a bomb in the exhaust port.

If you make it that far, why not toss the cassette in as well? *Chris Bourne*

Publisher System 3 Software **Price** £7.95 **Memory** 48K
Joystick Kempston, Sinclair, Cursor
★

more software on page 28

Confuzion



SHEER mental agony is the basic consequence of an hour playing **Confuzion**, the latest from Incentive. Deceptively simple, it will have you grinding your teeth and foaming at the mouth in minutes.

There is a tenuous plot to do with defusing bombs before they explode, but that is simply a peg on which to hang an unusual abstract maze game. You have to control a fuzzy ball which moves around a maze of interlocking lines and attempt to knock out the bombs at the edges before your time runs out. Rather than move the ball itself, you slide blocks of the maze about, creating new pathways, rather in the style of those slide puzzles where you have to make words or rearrange numbers.

There are 64 mazes in all to negotiate, and although the first few are easy enough, the introduction of enemy balls, extra bombs, and holes in the maze plan soon turn the play into a frenzied nightmare. The time limit is tight, but the faster you play the less chance you have of working out a logical plan in advance.

The presentation is pleasant, with thick lines for the mazes and good, solid sound effects. But the strength of the game is entirely due to the novel strategies and techniques you must develop to win.

Conventional wisdom demands that games should have strong themes and plots to succeed. It would be a pity if the abstract nature of **Confuzion** were held against it, as it generates more thrills and addiction than plenty of well-hyped intergalactic epics. 'Fun for all the family' as they say — give it a try and bend your brain to bits.

Chris Bourne

Publisher Incentive **Price** £6.95
Memory 48K **Joystick** Kempston, Sinclair, Cursor
★★★★

Chuckie Egg II

SO YOU THOUGHT you had seen the last of it. No more **Chuckie Egg**, no more little yellow Harry to run up ladders and jump off platforms. You were wrong. **Chuckie Egg II** has arrived, and it's every bit as nauseating as the original.

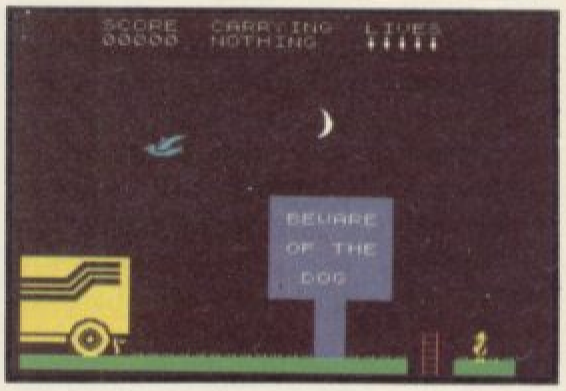
Chuckie Egg was one of the earliest levels and ladders programs, a game which everybody loathed and nobody could stop playing. The sequel has Harry attempting to get a chocolate egg factory working again, and has a definite arcade-adventure feel to it.

Played across 200 odd screens of basic girder-plus-peculiar-monsters graphics, **Chuckie Egg II** requires much shinning up of ropes and jumping over rats and lizards to complete. Objects which must be picked up along the way are used in other screens to delay monsters or achieve a particular exit.

There is little or nothing original about the program, which relies heavily on all the old conventions of the genre, although to be fair A&F can lay some claim to having established a few of those conventions themselves. The graphics are lurid and not of the best detail, but have that special Chuckie Egg quality all the same. An improvement is the abolition of the requirement to complete each screen before proceeding further. That is no longer necessary, and the resulting maze of exits and entrances to different screens is one of the more complex we have seen.

A competition with cash prizes for the highest scores adds a little zest to the proceedings, and certainly A&F groupies will find **Chuckie Egg II** just as frustratingly addictive as their first encounter with the henhouse, those many moons ago. *Chris Bourne*

Publisher A & F **Price** £6.90
Memory 48K **Joystick** Kempston, Sinclair
★★★



Mighty Magus

HOW THE mighty are fallen. Quicksilva, which produced **Ant Attack** and **Fantastic Voyage**, has just released a platform and ladders game.



Entitled **Mighty Magus**, the game is packed with the usual complement of spells, traps, monsters, and dragons.

As the Mighty Magus, you have to descend all 30 levels to the depths of the Rising Sun Temple, battle with monsters en route, avoid dozens of assorted traps and kill your arch-enemy Faugy The Fierce and escape back to your starting point.

The screen scrolls left, right, up and down with staircases leading to each level. Walking along the platform is dangerous in the extreme as they feature hidden traps — each one waiting for the wrong step to hurl you across the screen, make you disappear or to release a flight of poisoned arrows.

Treasure chests are situated throughout the levels which when searched bestow upon you magic which can be used to cast spells to open entrances and jump off stairs.

Mighty Magus is not a difficult game, frustrating perhaps and a far cry from the quality of **Fantastic Voyage**. The graphics are outdated, unclear and flickery — a pity it was not released a year ago. *Clare Edgeley*

Publisher Quicksilva **Price** £6.95
Memory 48K
★★

more software on page 30



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Spy Hunter

ONE OF THE more successful arcade games of last year looks set to have potential double agents roaring up to their local shops in hot pursuit for a copy of the game.

Sega has recently licensed **Spy Hunter** to US Gold and continues the trend of arcade games crossing the Atlantic as computer software.

Shades of the movie *The Italian Job* creep into the game which places you in the key role of a spy trying to escape the country with a posse of double agents on your tail.

Luckily your turbo-charged car could have been built for James Bond and will become amphibious, taking to the water like a drought-stricken duck.

The chase is fast and furious, skidding down stretches of icy road and hair-pin bends. You can shoot at the agents, try to bump them off the road, but blasting innocent civilian drivers will be to the detriment of your score.

You have a bird's eye view of the road which scrolls vertically downwards — the zig-zags are hair raising and do not leave much room for overtaking.

One innovative touch to the game is the weapons van. Just as in *The Italian Job*, the van drives past with ramps lowered. Should you be quick enough to drive in, the car will be re-armed with oil slicks, smoke screens and rockets — handy when shooting at the bomb-dropping helicopter. However, all weapons but the machine gun are lost if you crash.

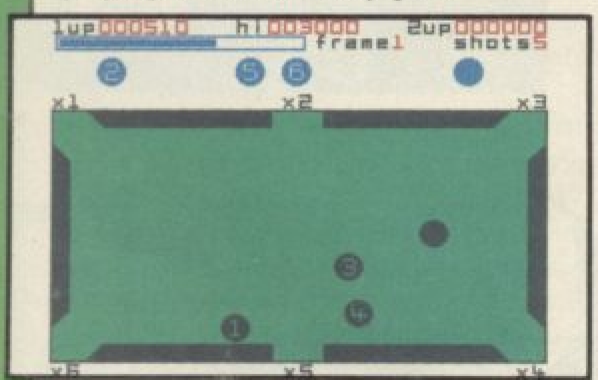


The game is obviously not as fast as the arcade version, but in all other cases it is an almost exact replica — except that there is no gear stick or accelerator. Those features are, however, notoriously difficult to fit onto the Spectrum. *Clare Edgeley*

Publisher US Gold **Price** £7.95
Memory 48K **Joystick** Kempston, Sinclair, Protek
★★★★

Video Pool

A GAME of pool usually entails consuming large quantities of beer whilst playing in some smoky pub.



OCP has come to the rescue of both lungs and liver and has produced **Video Pool.**.

The screen gives an aerial view of the pool table with six pockets which you can change from small to large size. The game offers three variations of pool — none of which are played according to the rules. For starters, there are only six numbered balls with the corresponding numbers on each of the pockets.

The three variations range from easy — where you have to pot the balls in any order into any of the pockets; a slightly harder version where the balls have to be potted numerically; and lastly a game where you have to pot the balls numerically into the correspondingly numbered pockets.

You gain an extra shot for each correctly potted ball and lose a life for a foul shot or wrong pot.

Video Pool is certainly worth playing despite the obvious dissimilarities with the real game. The movement of the balls is fast, smooth and flicker-free and the direction of the cue ball towards the cursor, positioned on the cushion, is accurate.

Clare Edgeley

Publisher OCP **Price** £5.95
Memory 48K **Joystick** Sinclair, Kempston, Cursor
★★★

Archon

THERE IS a world of difference between the intellectual precision of chess and the imaginative power of good fantasy games. All the more peculiar, then, that veteran fantasy game designers Paul Reiche and Jon Freeman should have combined the two to produce **Archon**.

The game is played out on a chequered board with 81 squares. The opposing armies remind one instantly of chess, with pawn-like knights and goblins, and stronger, more mobile pieces on the back row.

When two pieces clash for a square the game shifts to arcade action, and the monsters fight it out, blasting with fireballs or trying to close with fang or blade. White squares favour the forces of light, black squares darkness, and there are five power points with healing qualities and variable colour.

Although well packaged and presented, the graphics are predictable and seem old fashioned.

The problem is really that the abstract nature of the game serves to dissipate most of the creativity involved in producing interesting monsters. You rapidly lose any sense of involvement in the fantasy myths surrounding the struggle, and play the game mechanically.

The inclusion of magic spells for two of the pieces is a good idea, but again they are used merely as extra options in play, and have no real emotional force of their own.

Viewed as a board game, **Archon** is a competent invention, and clearly has strategic possibilities. But it is not ideally suited to the home computer, and we would have preferred to see Reiche turning the talent he used to good effect, with the creators of *Dungeons and Dragons* to more adventurous material.

Archon is a game for the collector of such things, not for those who want good entertainment at a fair price. The price is certainly not fair, and our rating would have been higher if Ariolasoft had charged less. *Chris Bourne*

Publisher Ariolasoft **Price** £10.95
Memory 48K **Joystick** Kempston, Sinclair
★★

more software on page 32



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Snapple Hopper

MACMILLAN has previously collaborated with Sinclair Research in a number of educational programs but the new range is produced on its own account.

Snapple Hopper and **Tops and Tails** are two packages aimed at the four- to eight-year-old age range. Both are devised by Betty Root who is the 1985 President of the United Kingdom Reading Association.

The **Sunflower Number Show** is a game to practise mental arithmetic for all ages. All the programs are flexible in that there is a choice of speed and in the maths program a choice of difficulty.

Snapple Hopper contains two routines to practise the initial two letters of a word in a Snap game for one or two players, and a game to practise matching rhyming. Both can be played by one or two players.

Tops and Tails has a snakes and ladders game with players moving according to the numbers generated on a dice, and receiving extra points for recognising the first two letters of a word on a picture square.

The graphics in the games are well



devised and the routines fun to play, at least for the younger members of the age range. Eight year olds may find it all rather unsophisticated. The only quibble I have is the price.

Theo Wood

Publisher Macmillan **Price** £5.95 each
Memory 48K
★★★

Jonah Barrington's Squash

SPORTS superstars endorsing computer games seems a trend that is likely to continue until all the superstars have been used up.

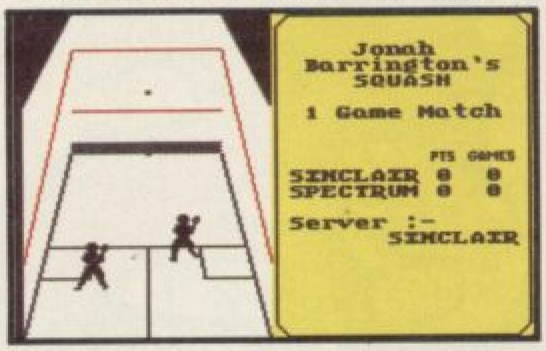
Jonah Barrington's Squash is endorsed by the former world champion and the score is called out in his own voice which has been 'accurately reproduced taking full advantage of the unique Reprosound system'.

However, plugging Jonah into the MIC socket produced a fuzzy unintelligible gabble as if he was speaking from the belly of the whale. Better get that throat seen to, Jonah.

The screen is divided, one half being the score table and the other a small 3D representation of a squash court.

The ball bounces off the walls in a convincing style and depending on the length of time the fire button is depressed, you can alter the angle at which the ball leaves the racket. The 3D illusion is effected by the use of a shadow on the ball, in much the same way as Psion's classic **Match Point**.

Hitting the ball can present a prob-



lem. It is very difficult. Whenever the ball comes within striking distance, press the firebutton and you will automatically play that shot whether forehand or backhand. Obstructing your opponent is a foul and a let is called, but unfortunately you can't assault him with your racket.

The game is an accurate simulation of the game and play is fast on the higher levels. Jonah seems impressed and says that it "is fun to play and will teach players at all levels to improve their game". Personally I would prefer to exhaust myself in the more conventional and sweaty way, actually playing the real thing.

Clare Edgeley

Publisher New Generation **Price** £7.95
Memory 48K **Joystick** Sinclair, Kempston, Programmable
★★★

911TS

"HEY GUYS, I just had a great idea in the bath. How about a game about a Porsche?"

"Triff, boss. And we could get a major tyre company like Dunlop Tyres SP Tyres UK Ltd to endorse it."



"Won't that cost greenbackwise?"

"No way. All we have to do is underline Dunlop Tyres wherever it apears on the insert and in the game. We could only allow players to use Dunlop tyres in the game. The possibilities hypewise are endlessville, boss."

"I like the way you're thinking. What do the programmers reckon on schedules? Can you do it for Monday, kid?"

"Uh, like, that's a bit heavy. I mean, I was going to take Sharon to the Motorhead concert tonight . . ."

"No sweat. Just lay down that old scrolling routine we used in all the other games."

"But the Porsche doesn't jump fences like the horses in **Grand National**, boss."

"So what? Put some bushes and logs n' stuff in the middle of the road. I saw this great ZX-81 game a couple of years ago in a mag which scrolled up the screen with bushes and things. You remember — I was playing it in the bath when I got the idea for **Kokotoni Wimp**."

"Don't you think the punters will notice?"

"Punters? Shmucks. No more arguments, boys, or its P45 city for the lot of you. Besides, when they see Dunlop Tyres all over the cassette they won't bother about the rest. We're talking action, we're talking hype, we're talking spondulistani . . ."

911TS. Another great game from Elite. Don't buy it.

Chris Bourne

Publisher Elite **Price** £7.95
Memory 48K **Joystick** Not Specified
★

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QL Toolkit

SINCE the hurried launch of the QL, Sinclair Research has been promising a package of routines and programs which will provide a better interface between SuperBasic and QDOS. At the same time this would add commands and functions which are useful but which are not included on the basic machine.

QL Toolkit, written by Tony Tebby, is the result and provides a host of software extensions which are split into functions in the form of SuperBasic commands, machine code programs, SuperBasic programs, filters and founts. The extensions can be booted into memory on power-up, using the function keys as usual. Once loaded a digital clock is displayed in window #0 the time on which can be altered using other functions provided within the package.

Once loaded it is possible to toggle between command entry, performed in window #0 and a SuperBasic full screen editor which highlights SuperBasic lines containing errors.

Other SuperBasic extensions include commands to check, on QDOS, jobs currently running. Those allow the user to multitask machine code jobs from SuperBasic and to alter their priorities. A set of demonstration routines is available for those who do not know how to use 68000 code but who want to see QDOS multitasking in action.

Other extensions deal with files and microdrives. One command gives a flexible 'read device directory' function which can be used to page through lists of files on microdrive rather than watching them go scrolling by at high speed.

It is also possible to use a form of random access storage with files on microdrive. Those react in a similar way to disc random access but recall of data is, of course, significantly slower.

Filters, if you did not know, are programs which perform single operations on input data before passing it to another program for output. **QL Toolkit** has seven of those including a conversion to upper case routine, and routines to copy, concatenate and split files into pages.

The machine code programs within the package are mainly examples for the multitasking extensions. They include a clock with hands, an alarm clock and some graphics demonstrations.

The SuperBasic routines, for the large part, consist of file copiers using one or two microdrives. It is possible to make a full copy of all files on a microdrive in less than two minutes or to select files for one or multiple copies. The last two programs rely on the user putting the names of the files to be copied into data statements within the routine.

No toolkit package would be complete without its copy routines and these do their work with efficiency. As it is possible to trap software copying programs you will find that you cannot make a master copy of such products as Psion's **QL Chess** but that the copiers come in handy when you have a lot of raw data to duplicate.

Despite its heady price the Toolkit does the QL justice and should find a place in any QL owner's library because it accomplishes a variety of involved tasks quickly and efficiently.

Unfortunately, if you intend purchasing it you should also buy the **QL Technical Manual.** The documentation provided with **QL Toolkit** is excellent but if you want to exploit it to the full the technical manual should be at your side. Another first class product from Sinclair Research.

John Gilbert

Publisher: Sinclair Research
Price: £24.95
★★★★★

Super Sprite Generator

GRAPHIC sprites are suddenly in vogue and Digital Precision has released the **QL Super Sprite Generator** to ensure that it captures that part of the market which is interested in making the most of the superb graphic capabilities available.

Sprites are user-defined graphics which have been magnified two or even three times. The Kit provides a set of Superbasic extensions and two demonstration programs called Alien and Bird.

As the example titles suggest, the demos are simple but it is possible to move the sample graphics around the screen with the arrow keys. The examples also demonstrate how slow the sprites are when controlled by Superbasic in an animated display. The switch between sprite-frames is slow and the resulting image is jumpy and flickery.

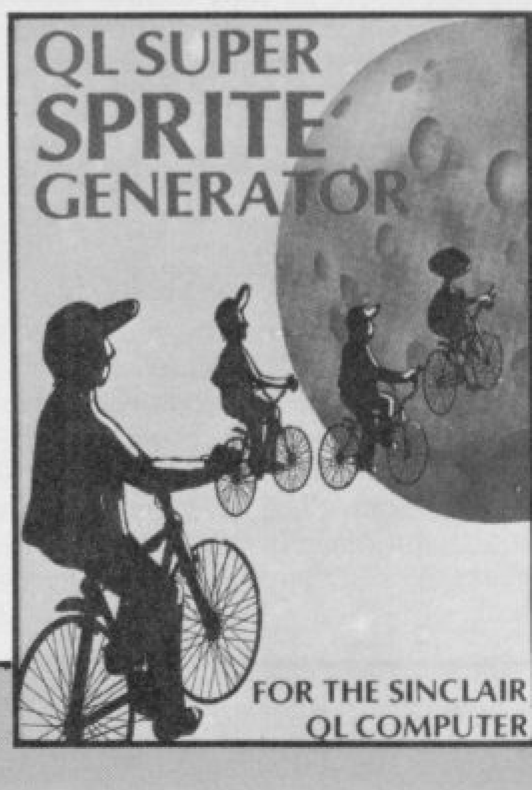
But those are only examples, the idea of the kit is to set up the sprites and then deal with them as you wish. To design a sprite you load in the design program. The program runs in a similar fashion to those UDG generator programs of which you see so many in magazines. A grid is drawn on the screen and, using the arrow keys, you can move around the squares of that grid.

Once finished you can file the sprite frame. To make an animated display just create several frames, each one a progression in movement from the last. It is possible to reverse the direction of the sprite within the design program.

When you are happy with the result you can enter the construct program which asks you the frame order in which you want to put your sprite. It then puts the frames into a single file which can be called by your own programs.

The package contains everything which you will need to produce animated sprites but it is dramatically over-priced. For a similar package on the Spectrum you would expect to pay £6.00. The excuse may be the price of microdrives but taking development costs into account, the price could be cut by at least a quarter. *John Gilbert*

Publisher Digital Precision
Price £24.95
★★★



GRAPHIQL

SUPERBASIC is not the ideal medium for producing good pictures on the QL, but the machine has the potential for graphics of great sophistication. Talent Computer Systems has now released **GRAPHIQL** to remedy the situation.

The program is an aid for developing graphic screens, and incorporates several features which make it easy to construct complex designs with a minimum of effort. The most impressive of those is a magnification facility, which allows you to blow up any section to 16 times actual size in order to make adjustments to artwork.

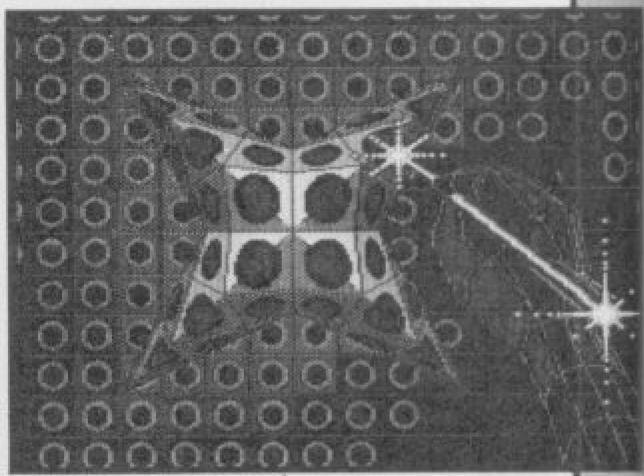
Eight colours are available, but stipple and airbrush 'splatter' effects are easily produced to give an almost infinite range of shades and combinations. That is done through the use of a doodle pad, which operates much as an artist's palette. By defining a small box on the pad, you can then fill it with patterns, ranging from abstract shading to brickwork or even a small house or tree. That pattern, called a texture, can then be painted onto the main screen.

Freehand drawing is supported, but a variety of circles and ellipses, squares and rectangles can be produced using a 'rubber band' system where the shape can be stretched or compressed until it is satisfactory. You can recolour areas, rotate and reflect shapes about the screen and use a 'paint brush' of any thickness.

The manual supplied with the program is 60 pages long, but to their credit the writers have decided to assume users have no experience whatever and spell out each operation in great detail, with examples and suggestions. In fact, after reading through the manual once and trying the examples as you go, you should be able to remember most of the command keys available.

If the program has a fault, it is in speed of operation, which is a little slow if you already know exactly what you want to do next. However, Talent has packed a great deal into the package, and uses it to produce its own title screens, which is surely one recommendation. Certainly anybody interested in computer graphics will want to own **GRAPHIQL**. *Chris Bourne*

Publisher Talent
Price £34.95
*****



Super Backgammon

FOLLOWING Chess, it was only a matter of time before Backgammon was written for the QL. The ancient game has taken a few knocks since computer programmers got their paws on it, and the Digital Precision version is about par for the course.

A Quill document included on the tape provides a description of the program and the rules of the game, for those who do not know or can only read words on a TV screen instead of the box insert. A copy facility allows you to make a backup of the various Basic programs which do the business.

The game is neatly presented, although nothing like as spectacular as it might have been if written in all-singing all-dancing 68000 code. To move, you type in the number of the two points involved. It would have been friendlier if the cursor keys could have been used to lift and move pieces.

Digital Precision might have been wise not to include certain features of the rules in its description. The QL is simply not interested in doubling dice and will not even recognise a gammon victory, where you get all your pieces off before the QL removes one. Its game is generally poor, even at the highest level of four, and any reasonable player should thrash it. Some of its moves are positively anile, especially at the lower levels.

Worse still, it cheats. According to the rules, you must play both dice if you can. It's no good moving one to make yourself unable to play the second. Digital Precision knows that, because it is on the insert. The QL clearly doesn't, and can smugly play accordingly.

A computer which cheats when, nine times out of ten, it ought to be able to beat most people at any remotely intellectual game, is an unlovely thing. Digital Precision should teach the QL good manners if they plan to continue producing software for it. *Chris Bourne*

Publisher Digital Precision
Price £15.95
**

Area Radar Controller

WHY air traffic control simulations should be regarded as sellable products to the micromarket is one of the great mysteries of the software industry. Shadowsoft has brought out **Area Radar Controller** for the QL, in which you can relive the worst nightmares of the Gatwick control tower staff.

The program is written entirely in Basic, and one hesitates to say it would not disgrace a Vic 20 because Vic 20 owners might get uppity. The screen shows two little runways and some squares around the edges of the screen which are the exit points for aircraft.

There are three types of plane involved — slow, medium and fast. They represent something quite new in aviation because they only move in ten directions, north, north-east etc, and up and down. You use a series of abbreviations to instruct various aircraft to move.

By Klono's viscous frontal lobes, what on earth is going on? The QL is capable of stunning graphics, fast code, and has a spacious memory to exploit. Much more of this sort of fast-buck garbage and any mass market the machine might have attracted will be dead and gone before you can say Frogger. *Chris Bourne*

Publisher Shadowsoft
Price £10.95
*

MicroPeripherals cut discs

THE MicroPeripherals QL disc interface marks a departure for the company, away from printers and into dedicated add-ons. It is also unusual in that it contains none of the **Toolkit** from Tony Tebby.

With the interface MicroP supplies a disc which contains a number of utilities. It can also supply QL dedicated — in other words painted black — 3½ in, 80 track, double sided, disc drives. Those give 1434 useable sectors when formatted.

Inside the interface, which has to be taken apart, are a series of jumper connectors. Normally the interface responds to the device name FDK but by connecting one of the jumpers — a connector is supplied — it can be made to respond on power up to MDV. In that way programs on microdrive can be transferred to the disc without alteration and will still run.

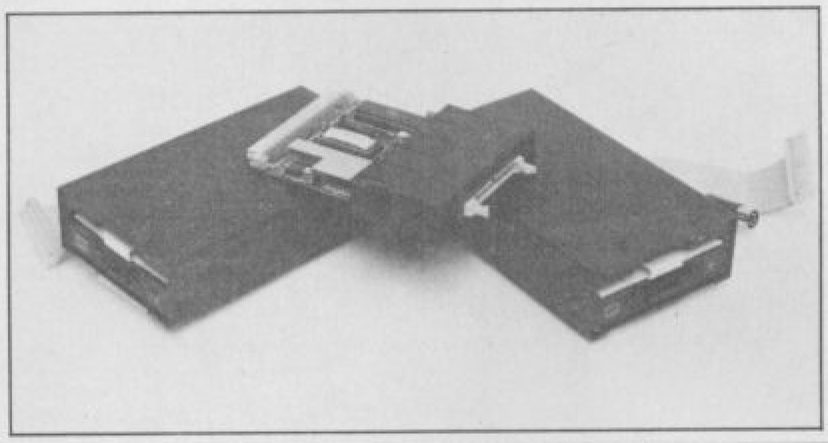
The instructions — those supplied with the review model were marked Preliminary — are brief but adequate. One criticism might be that the first thing the instructions tell you to do is to format a disc. As the only disc supplied contains the utilities that could be disastrous. A note of warning would be appropriate.

In operation the disc drives accept the same commands and perform in the same way as microdrives. In addition the interface supplies four new commands. FSET and MSET perform the same function as the jumper mentioned above, MSET gives the disc drives the name MDV, and FSET, FDK. The other two, DGET and DPUT, allow you to assign a sector, not the directory, on the disc to an array and then write it back. This addition allows for simple disc editing.

The utilities disc contains nine programs, six of them multitasking routines. Those allow you to make backups of a disc; perform a string replacement on a disc file; obtain an extended directory, including the file length, and easily delete files; inspect a file on screen; and spool a file to another device — that is, you could print a file while running another program.

The other three programs are DAME, a disc and memory editor which allows you to alter a disc or memory easily; Colprint, a screen dump program for colour printers; and repos_bas, a window defining program.

All programs are supplied on a 3½in disc. With an 80 track, double-sided, 5¼in drive connected as drive one the system becomes rather temperamental. It will not reliably write to and read from it. It can read the directory of a CST disc, and in some cases load a program from it, but not one of its own discs.



The price of the system, £113.85, makes it the cheapest available so far and as such it is worth consideration. However, added to that is the need to use the MicroP drives, £194.35 for the first drive and £171.35 for the second. Those are reasonable prices but 3½in discs are almost twice the price of 5¼ which adds to the cost.

MicroPeripherals Ltd, Intec Unit 3, Hassocks Wood, Wade Road, Hampshire Tel 0256-473232.

Taking a suite on board

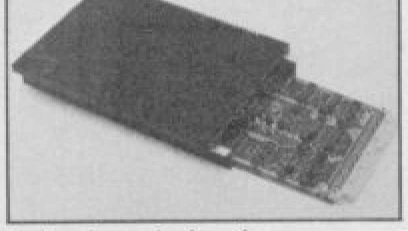
QUEST, who was one of the first companies to announce QL hardware, has released four RAM boards ranging from 64K up to the full 512K.

When extra RAM is fitted to the QL it performs two functions. It is used as both additional buffer space for the microdrives, which makes access times quicker, and for the program data. In addition it allows programs to run much faster than normal.

That is due to the design of the internal hardware. Every 50th of a second the ULA in the QL takes charge of the bottom memory and uses the screen area to send the picture to the TV. The CPU cannot access this memory at the same time and has to sit, twiddling its thumbs, until the ULA has finished with the memory.

If you fit additional memory, over and above the standard 128K, the CPU can access it while the ULA is dealing with the picture and so it is not slowed down. The increase in speed can be as high as 50 percent.

As a bonus a cartridge is supplied with a program which allows you to use some of this memory as a RAM disc; this works as though it were a normal disc



drive but, being in memory, access times are faster.

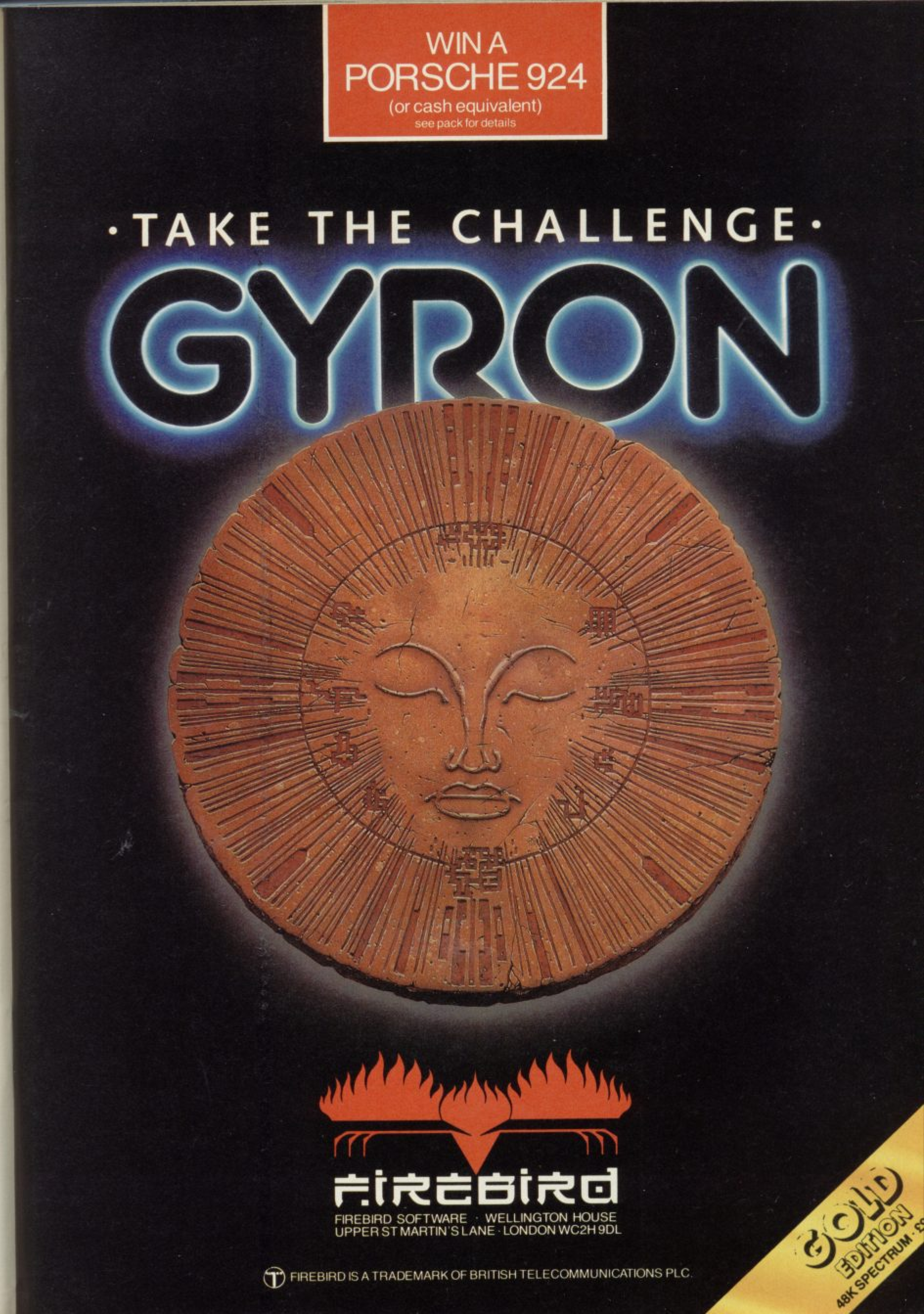
RAM discs normally use the device name RDV but this can be changed to be MDV. This makes it possible to run the version 1.00 Psion programs on them; version 2.00 can be configured to use any name.

The increase in speed of the Psion programs, which can be run from a RAM disc, plus the added space for data, transforms them into very professional pieces of software. The only problem with this extra memory space is that with a large amount of data it cannot all be stored on one microdrive cartridge.

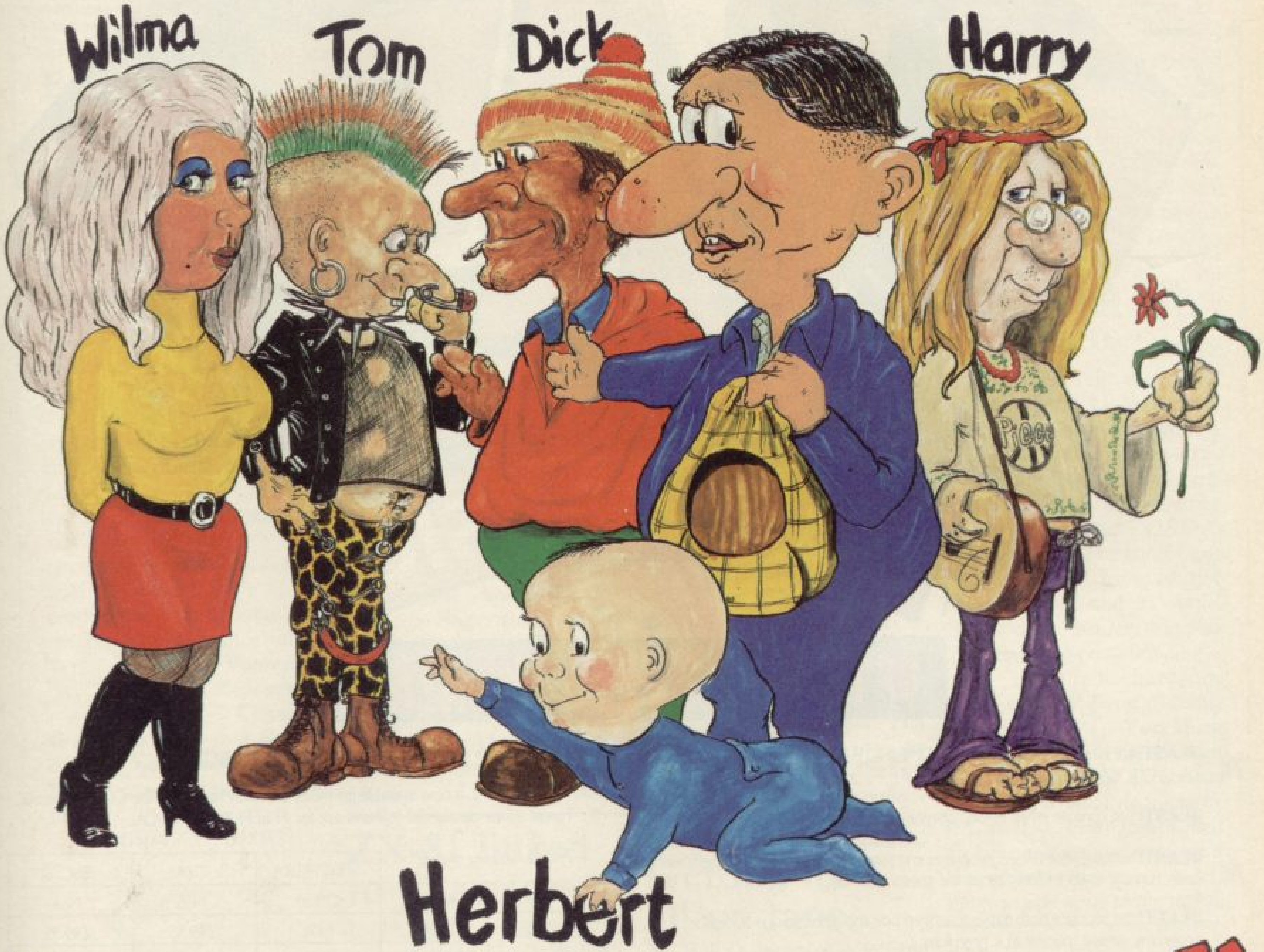
While extra memory can be very useful the RAM disc facility is somewhat limited. The process to use them on, for example **Quill**, would be: 1 — load RAM disc software; 2 — format RAM disc; 3 — copy **Quill** to RAM disc; 4 — run **Quill**; 5 — copy data file from RAM disc back to microdrive.

All four upgrades — 64K £115, 128K £185, 256K £349 and 512K £579 — are more expensive than others available.

For further details, contact Quest Automation, School Lane, Chandler's Ford, Hampshire SO5 3YY. Tel: 04215-66321.


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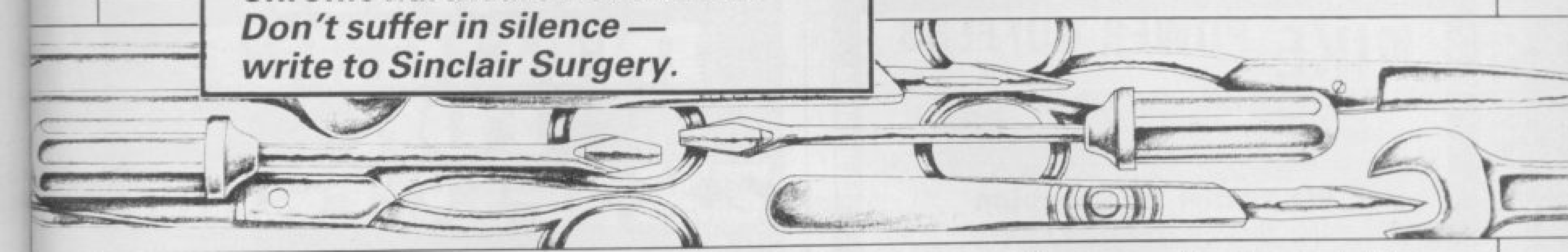
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Brother pin connections

I RECENTLY purchased a Brother M1009 printer to work with, in addition to a Newbury-type terminal, my Spectrum and Interface 1.

I have so far spectacularly failed to get the printer working. Unfortunately, I have had to make my RS232 lead as none appear to be available in the shops, and in spite of Brother advising me by telephone of the pin connections and internal switch settings — nothing.

Where can I buy the necessary serial connecting lead? In case I can't find a ready made lead, what are the pin to pin connections?

Dave Postance, Stockport, Cheshire

● *In order to run your Brother M1009 from Interface 1 you should connect the following pins:*

Spectrum	*M1009*
2	2
3	20
4	3
5	5
7	7
9	6

Any competent electrical shop should be able to make up a lead for you.

Modem price suspicions

I AM wishing to purchase a modem for the Spectrum and I had intended to buy the VTX5000.

I now note from the May edition of *Sinclar User* that the price has been considerably reduced and having suffered Sinclair's reductions almost immediately following the purchase of various items of theirs, I have become suspicious of manufacturers who reduce their prices.

Is the VTX5000 a good buy or is there an alternative modem, in approximately the same price range?

Also, is it possible to obtain any hardware which will enable the Smith Corona Fastext 80 dot matrix printer to copy Spectrum graphics?

J D Burton, Battle, East Sussex

● *The VTX5000 is unlikely to come down any further in price — as far as we know — in the near future. It is very good value and the only Spectrum modem under £100.*

To copy Spectrum graphics to a Smith Corona Fastext 80 you will need additional software. Contact the makers of your printer's interface or get hold of a Kempston 'E' as that has the necessary software built in.

ZX-81 linked to Spectrum

I HAVE had a ZX-81 for some time and have recently bought a Spectrum.

I would like to be able to connect the two machines so that I may utilise the ZX-81 memory for the Spectrum and possibly use the processor in the ZX-81 as a second processor. Is this possible?

James Anderson, Edinburgh

● *It is possible to connect a Spectrum and ZX-81. The easiest way would be by using an input/output port on each or, if you can write the code, via the cassette port.*

It would be very difficult to add a second processor to the Spectrum, due to the design of the ULA.

Spectrum in the network

I HAVE a working RS232 interface for the 48K Spectrum, but hope that you can tell me what can be done to allow the Spectrum to transmit a program which it has in its memory, to be recorded in a data file of another, larger, micro.

At present all I can manage is the obvious, that of keyboard entries on one machine appearing on the screen of the other! I can of course record or print this, but it is not exactly a worthwhile occupation.

David Storrar, Lydney, Gloucestershire

● *It is possible to transfer data via an RS232 port. If you have Interface 1 fitted you simply have to Load and Save code via the 'b' channel. You could also print it to the port using the 't' channel which will omit any Spectrum control characters.*

Getting it all on tape

WOULD you please tell me how to record programs onto tape?

I have only just got a Spectrum and I have read my manual but I can't understand it. It says 'then start the tape' and what does that mean — press Play and Record or just Play?

Andrew McColl, St Helens, Merseyside

● *In order to save a program enter SAVE "NAME"; SAVE is the keyword on the S key and NAME is whatever you want the program to be called. Now press ENTER once and 'Start tape, then press any key', will appear at the bottom of the screen.*

Start the tape deck by pressing PLAY and RECORD, wait a few seconds, and then press any key — other than SHIFT — on the Spectrum keyboard. The program will be saved to tape in two blocks automatically.

Switching off a cassette

CAN YOU tell me what kind of switch I would need to put on line between a Spectrum and a cassette recorder to save the constant plugging and unplugging during SAVE and LOAD.

Someone has come up with a switch to save the power socket and I would like to do a similar thing to the cassette-Spectrum line.

D A Richardson, Frodingham, Yorkshire

● *All you have to do is put an on/off switch in the MIC line; the earth surrounding it can be left as it is. Any switch will do, but preferably one with a low voltage rating as it is less likely to add noise to the signal.*

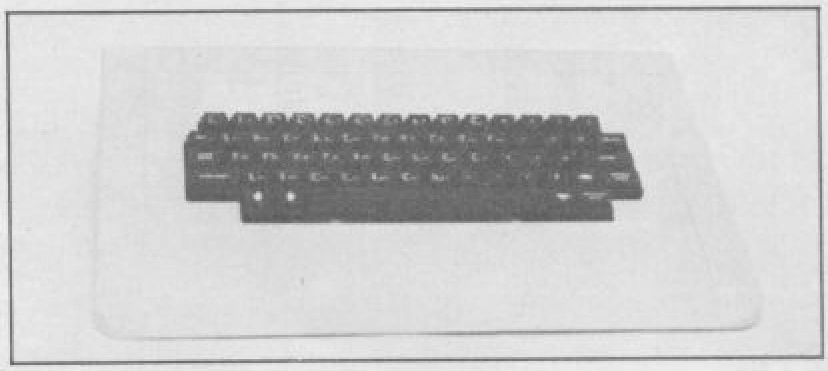
Clearing up a heavy load

HAVING had my computer for nearly three years I have a problem loading some games like **Gift from the Gods, Kung Fu, Avalon** and **Mad Martha.** The problem seems to be with the CLEAR statement at the beginning. It gives the report 'RAMtop no good'.

Gregory McDougall, Birmingham

● *If you have Interface 1 fitted that could be causing the problem. Enter PRINT USR 0 to reset the computer before loading the program.*

Lazer 62



WITH AN estimated 1.5 million Spectrums still in rubber keyboards, and more being produced for the overseas market, add-on keyboards are still selling well. The latest to be released is the Lazer 62 from Micro Board.

The 62 stands for the number of keys, the original 40 plus an extra 22 single key functions. Other extras are proper moving keys, not a membrane as on the Spectrum Plus, a full-sized space bar and a built in on/off switch.

Those extras are not without cost, £59.95 to be precise, and one or two corners have been cut in the manufacture. Despite that, if you are careful when assembling it, it has a lot to offer in this already crowded market.

Assembly entails removing the circuit board from the Spectrum and then clipping it into the base. The top of the keyboard is made of plastic, with a suitable area to rest your hands when typing, but the base is metal and that presents the first problem.

As the keyboard is very thin, standing just over 4cm high, there is very little clearance between the PCB and the base. Although there is one strip of plastic tape as an insulator that only covers a small area and it is not totally adequate. For piece of mind on the review model I added many yards of sticky tape.

The keyboard proper is clipped above the PCB, again a tight fit, and the top of the case over that. That is problem number two. On the review model the casing fouled the keys so that some of them would not spring back after they had been pressed. A few minutes with a sharp knife cured this.

Once the keyboard is screwed together you then have to stick the legends on the keys, with 62 keys a long job. Later models should have a better fitting case and re-designed legends, the current ones being printed all in white.

Where the keyboard scores is the multitude of extra keys. Those are $#()"-+;:=,./* plus four shifted cursor keys, E mode, delete, Edit and Caps Lock. Unlike many keyboards with single key functions it will still work with programs that use Interrupt Mode 2 — such as Beta Basic.

With the availability of the Spectrum Plus upgrade — see elsewhere in Hardware World — at £20.00 the Lazer 62 represents a hefty investment, but if you want proper keys it has much to offer. The keys have a reasonable feel and a spot of grease works wonders.

Further details from Micro Board International, The School House, Station Approach, Woking, Surrey GU22 7UY. Tel: 04862 24567.

Tape decks only for the dedicated

JUDGING from our mailbag many users experience difficulty finding a suitable cassette deck to use with their computer. Ever ready to bow to your wishes we obtained two computer-dedicated decks for review.

The first, the Twillstar MC3810, priced £25.95, made us realise the sort of problems you are liable to encounter. The instructions are completely in German.

Special cassette leads are supplied for the Spectrum which terminate, at the deck end, in a six-pin and a seven-pin DIN plug. Why so many pins are required when only two are used is still a mystery.

Twillstar MC3810



Binatone Data Recorder



The drive mechanism is held vertically and features full autostop and an air-damped door. It has a counter and there are five lights on the front which show if you are loading or saving, and if a signal is present.

The deck saved and loaded with no problems — you do not have to swop leads — and managed to load our specially-prepared poor quality tape.

Hoping to fare better we looked at the second deck, the Binatone Data Recorder, priced £29.95. This is more compact than the Twillstar unit and has the power supply inside — you have to add your own mains plug. It uses the Sinclair supplied cassette leads and the instructions, in English, even have a diagram of a Spectrum showing what to plug in where.

The deck mechanism is again held vertically and the door damped. To the right is a counter, on/off switch and monitor switch. On the side is a volume control, although it features an ALC — Automatic Level Control — and a phase switch which inverts the signal. The whole thing is securely held in a beige plastic case.

We saved a program and then tried to load it back. This proved to be impossible. The tape would load on another cassette recorder and we could hear the signal using the monitor, but it just would not load.

Details from Twillstar Computers Ltd, 17 Regina Road, Southall, Middlesex UB2 5PL. Tel: 01-574 5271, and Binatone International Ltd, Binatone House, 1 Beresford Avenue, Wembley, Middlesex HA0 1YX. Tel: 01-903 5211.

Budding Pilot

KEMPSTON compatible joystick interfaces are popular at the moment and the latest to be released is the Bud Pilot, priced £9.95. The only difference between it and all others is the inclusion of a power-on LED and the fact that it uses a 23-way (ZX-81 style) edge connector. That enables it to fit behind other add-ons, such as the ZX Printer and Interface Two.

For more information of this and other interfaces contact Bud Computers Ltd, 196 Milburn Road, Ashington, Northumberland NE63 0PH. Tel: 0670-856616.

more hardware on page 48

Kit Plus guarantee

IN ORDER to answer some of its critics Sinclair has released the Spectrum Upgrade Kit, which will turn your rubber keyed Spectrum into a Spectrum Plus. What is more, the kit only costs £20.00 and will not invalidate your warranty when fitted. If you do not want to fit it yourself Sinclair offers an upgrade service, for £30.00.

The upgrade kit is largely the same as any other add-on keyboard but may require some soldering. As a bonus, however, you get a new Spectrum Plus manual and cassette. The manual merely demonstrates how good the old manual was.

Fitting is straightforward and helped considerably by the clear instruction sheet. A new heat sink is provided for Issues 1 and 2, which is slightly smaller than the original, to fit the new case.

Next is the reset switch, soldered into place. It can, if you are not used to soldering, be left out.

Now you can test the new keyboard. Not all Spectrums will work correctly at this point. The company tends to use the cheapest components which means that each Spectrum will vary slightly. To overcome that a resistor — provided — has to be soldered onto the circuit board, a very fiddly operation.

You now have a Spectrum Plus. If you cannot get it to work Sinclair offers a fixing service, for £10.00. Send them the bits and they return a working computer.

As an add-on keyboard it offers 58 keys — 12 of them single key functions — and a half-sized space bar. Most useful are the shifted cursor keys and the only surprise is the omission of a colon key.

The keyboard feels cramped in use and is actually 0.5cm smaller across the Q and P keys than the rubber Spectrum. The caps are printed all in white which makes finding shifted functions difficult.

At £20.00 it is a bargain and, unless you are prepared to spend more than twice that, very good.

Write to Sinclair Research Ltd, Upgrade Department, Stanhope Road, Camberley, Surrey GU15 3PS.

Quality print at a low cost

WHILE the prices of dot matrix printers have been falling in recent years the price of daisywheel printers has remained fairly high, with only one at under £300. The Ibico LTR-1 is an 'impact band' printer which gives daisywheel quality print for only £169.95.

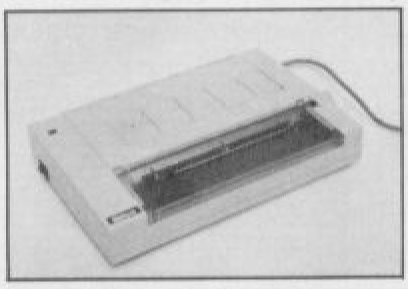
The low price means that it has a limited number of features, but surprisingly it has both Centronics and RS232C inputs as standard.

The printer is small, measuring 298mm by 63mm by 198mm, and is designed to take standard A4 sheets of paper. Tractor-fed paper can be used if the perforations are removed. There are no feed buttons provided, only a manual knob which, annoyingly, has to be pushed in and turned to feed the paper. You can only feed forwards.

Few control codes are available. The printer uses a buffer to store one line before it is printed. Carriage return and line feed operate as normal except that if they are received in reverse order double space printing is performed. Backspace deletes the previous character in the buffer, which means that you cannot use underscore to underline text.

Like a daisywheel the printer is fairly slow. It operates at 12 characters per second, which is average for a daisywheel.

Despite those limitations we had no problems driving it from both **Tasword II** and **Quill** or obtaining listings.



The output is reminiscent to that from a portable typewriter and, apart from being uneven in places, was very good. If you are looking for a low cost daisywheel printer the LTR-1 represents value for money.

For further details contact Saga Systems, 2 Eve Road, Woking, Surrey GU21 4JT. Tel: 04862 22977.

Raising the standard

KEMPSTON has greeted the launch of the Spectrum Plus by redesigning all its hardware to be easily fitted to the new machine.

Kempston, of course, are noted for inventing the Kempston standard for joystick interfaces and the price is now down to £9.95. The instructions supplied with it contain a useful routine to convert Psion's **Flight Simulator** to the Kempston standard. The Pro joystick interface, which has three sockets — Kempston and Cursor on one and Sinclair on the other two — plus a ROM socket, is now £19.95.

The company has also brought out two new joysticks, the Formula 1 and 2. The Formula 2 is the cheaper at £11.95 and features three fire buttons, one on the stick and two on the base. It is similar to the Quickshot I, and has a similar sloppy feel, even down to the rubber suckers on the bottom.

The Formula 1, at £16.95, is a much more rugged joystick. It uses microswitches for the stick and leaf switches for the two large fire buttons. Kempston says that all internal parts can be replaced.

Another new addition is the Score Board joystick, priced £28.95. That is simply a joystick with a very large base, similar in size to a rubber Spectrum, with two fire buttons.

Further information from Kempston Micro Electronics Ltd, Singer Way, Woburn Road Industrial Estate, Kempston, Bedfordshire MK42 7AF. Tel: 0234 856633.



Pro interface, Formula 1



Standard interface, Formula 2

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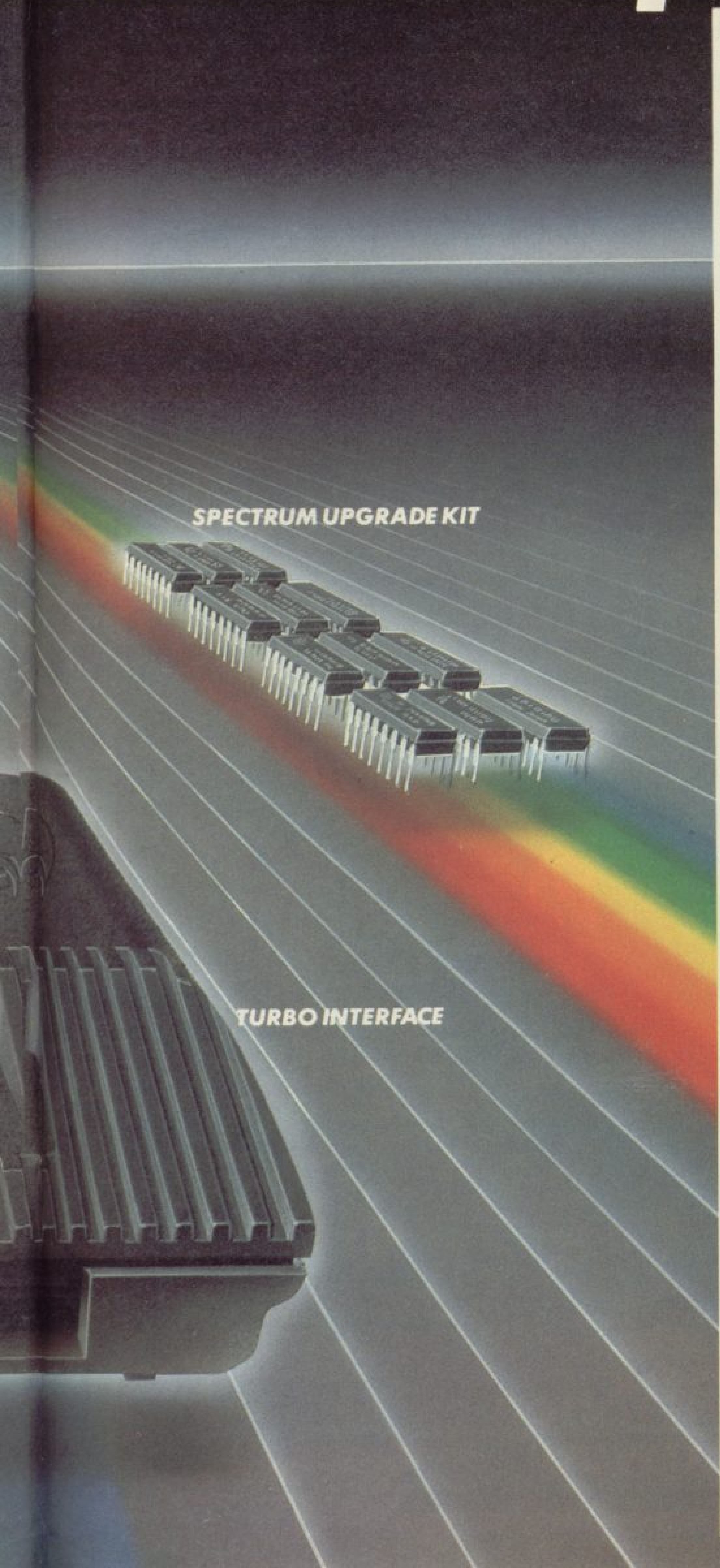
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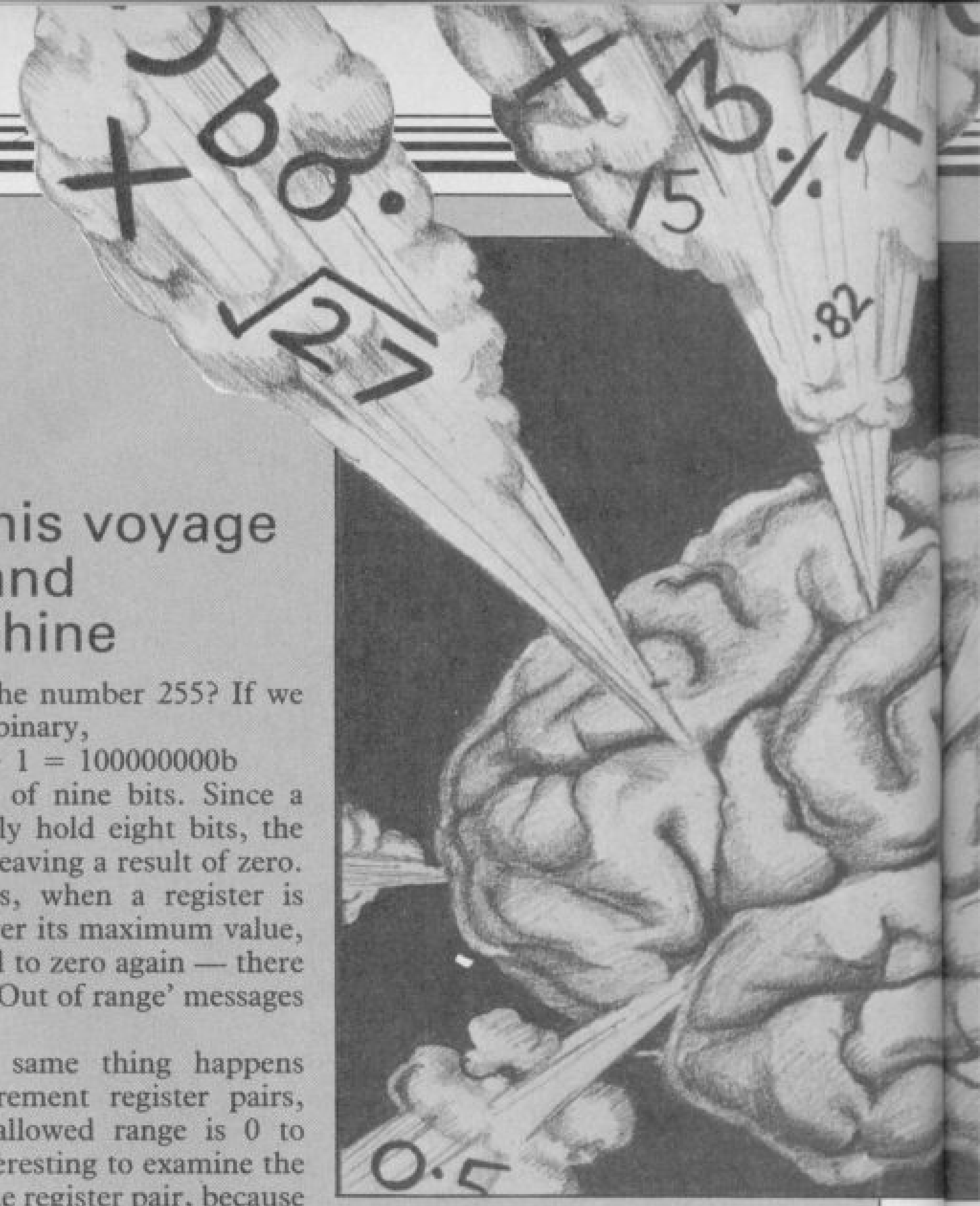
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The day of reckoning

Marcus Jeffreys continues his voyage into the realms of the Z80 and discovers a calculating machine

LAST MONTH, we looked at the 'load' instructions available using the Z80 instruction code. Now we will cover a few of the necessary evils — machine code arithmetic! We'll also use a couple of these arithmetic instructions to implement a high class screen clearing routine, which you'll be able to use in your own programs.

We have already seen an arithmetic statement in last months routine:

INC HL ;HL = Next byte in file area

As you probably guessed, that has the effect of adding one to the HL register pair. Remember, we didn't use any brackets. So the HL registers are changed. Not the contents of the location which they address. The instruction:

INC (HL)

would have a different effect. The sequence of instructions in figure one may make this clearer.

```
                ORG     60000
                LOAD    60000
EA60 21D204     LD      HL,1234     ;HL = 1234
EA63 3663       LD      (HL),99     ;The contents of location
                                    ; 1234 are set to 99
EA65 34         INC     (HL)        ;The contents of location
                                    ; 1234 now equal 100
EA66 23         INC     HL          ;HL now contains 1235
EA67 C9         RET
                END
```

Figure 1

We can increment the other register pairs in the same way, with:

INC BC

and

INC DE

but there are no instructions to change the contents of these addresses by surrounding them with brackets. In addition, there are increment instructions for all the single registers, so:

INC A

would add one to the A (accumulator) register.

As mentioned in the first article, each register can only hold a number in the range 0 to 255, so what happens if we try to increment a register which already holds the number 255? If we look at this in binary,

11111111b + 1 = 100000000b

giving a result of nine bits. Since a register can only hold eight bits, the top bit is lost, leaving a result of zero. In other words, when a register is incremented over its maximum value, it wraps around to zero again — there are no helpful 'Out of range' messages like Basic.

Exactly the same thing happens when you increment register pairs, but here the allowed range is 0 to 65535. It is interesting to examine the lower byte of the register pair, because it acts in the same way as a single register, wrapping around to zero. However, here the ninth bit is not lost, but carried over to be added to the high byte register. So

```
LD B,0    ;Top byte contains zero
LD C,255  ;Lower byte is set to the
           maximum value
INC BC    ; BC should now be 256,
           which means B now con-
           tains the value 1 and C
           has wrapped around to zero.
```

In much the same way as increment works, you can decrement registers, which subtracts one from the register contents. Values wrap around in the same way too, so

```
LD A,0  ;A = 0
DEV A   ;A = 255
```

All of the INCrement and DECrement instructions are displayed in detail in figure nine.

Of course, it is not always the case that you only want to add or subtract the value '1'; you may want to add, say, five to a register. You could do that by forming a loop to add or subtract a certain number of times, but fortunately Z80 contains more generally useful add and subtract commands. The instruction:

ADD A,5

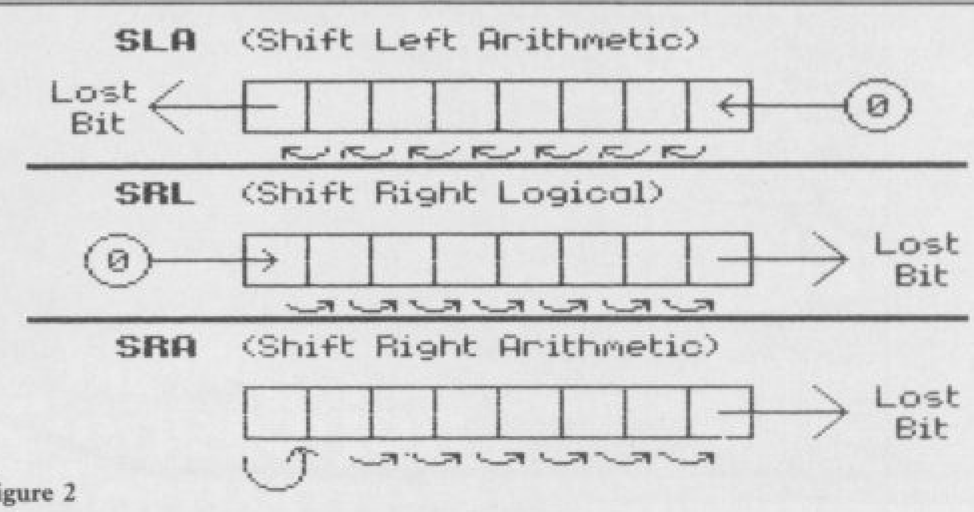
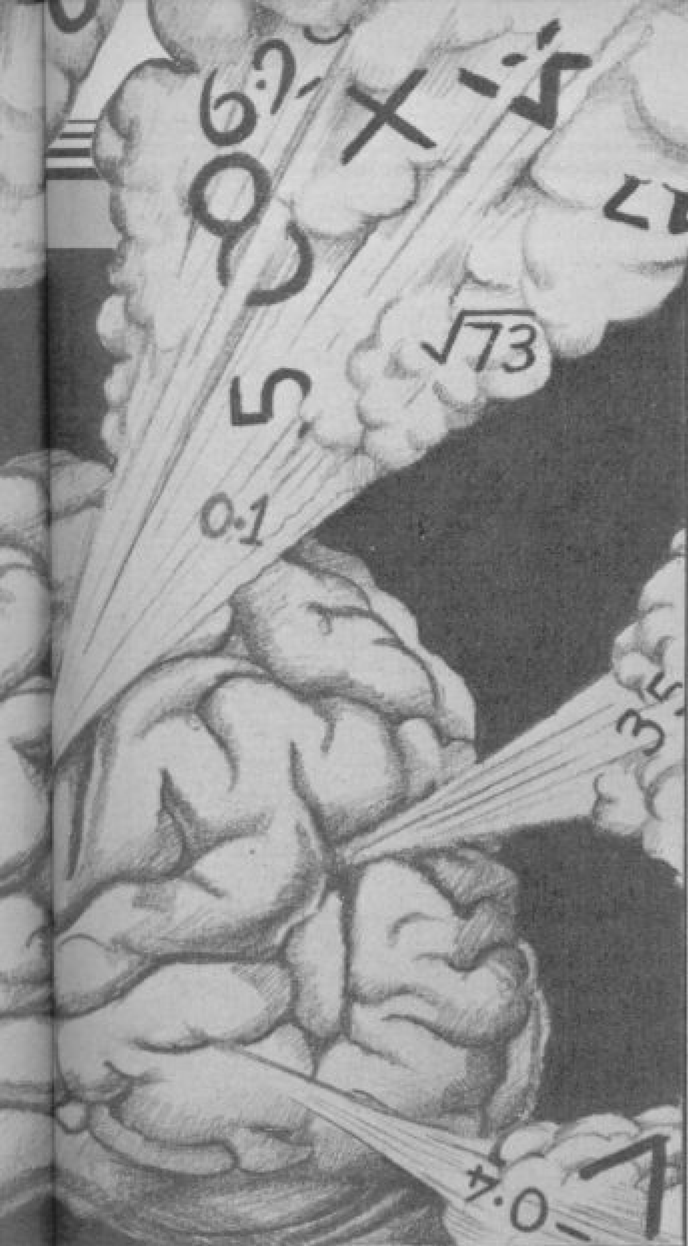


Figure 2



would add five to the accumulator. Most processing is carried out in the A register (accumulator — hence its name), so there are no equivalent instructions for other registers. You can add registers to the accumulator using the instructions

ADD A,reg (reg = A,B,C,D,E,H or L)

Yes, it's even possible to add the accumulator to itself with the instruction:

ADD A,A

If no wrap around occurs, then this will have the effect of doubling the contents of the A register.

Another useful ADD instruction is

ADD A,(HL)

which will add the contents of the byte location addressed by the HL register pair to the accumulator. This may sound a bit of a mouthful, but to make it clearer:

LD A,8 ;A = 8

LD HL,123 ;HL = 123

LD (HL),5 ;The location 123 now contains 5

ADD A,(HL) ;A = 15 (8+5), not 131.

Finally, you can add register pairs together, as long as the result is in the HL register pair, using

ADD HL,rp (rp = BC, DE or HL)

Here again, you could double the contents of HL by adding it to itself.

As you might expect, most of these instructions, but not quite all of them, have similar SUBtraction instructions of the form:

SUB A,17

which subtracts 17 from the contents of the A register. All of these instructions are shown in figure nine.

When a value exceeds the range of a register, we said that the ninth bit is lost: however, that is not quite true. In the first article, we referred to an F register, but we have not yet used it. The F register is a special register which holds YES/NO values, called Flags, which we may find useful.

So, when a result wraps around a bit — binary digit — in the F register is set to one. That bit is known as the carry flag, and can be used for operations on large numbers — that is, greater than 65535 — but we will leave that for another article, and instead cover something more interesting.

The Z80 instruction set does not have any multiplication or division instructions, so those have to be simulated using repeated additions or subtractions. There are a few 'shift' instructions to make life a little easier.

If we were to shift all the bits in a register to the left, then we would in effect multiply the contents by two.

```
                          ORG     60000
                          LOAD    60000
EA60 0608                 LD      B.8          ;B counts through 8 shifts
EA62 210040     NEXT      LD      HL,16384     ;HL = Start of screen memory
EA65 110018               LD      DE,6144      ;DE = Number of screen bytes
EA68 CB3E       SHIFT     SRL     (HL)         ;Shift each screen byte right
EA6A 23                   INC     HL           ;Increment to next byte
EA6B 1B                   DEC     DE           ;Count the shifted locations
EA6C 7A                   LD      A,D
EA6D B3                   OR      E            ;Jump to label SHIFT if DE is
EA6E 20F8                 JR      NZ,SHIFT     ; still greater than zero
EA70 10F0                 DJNZ    NEXT         ;Repeat from NEXT eight times
EA72 C9                   RET
                          END
```

Figure 3

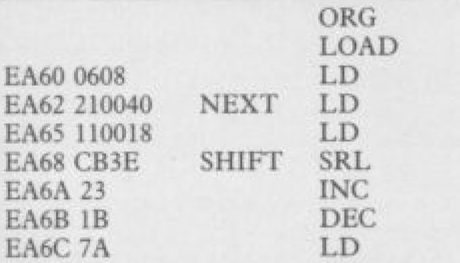


Figure 4

```
10 FOR i=1 TO 704
20 PRINT CHR$ (25*RND+65);
30 NEXT i
40 FOR j=1 TO 8
50 FOR i=16384 TO 16384+6143
60 POKE i,INT (PEEK i/2)
70 NEXT i
80 NEXT j
90 STOP
```

Figure 5

```
  10 CLEAR 59999
  20 GO SUB 1000
  30 CLS
  40 FOR i=1 TO 704
  50 PRINT CHR$ (25*RND+65);
  60 NEXT i
  70 RANDOMIZE USR 60000
  80 STOP
1000 REM HEX LOAD ROUTINE
1010 DEF FN p(x)=CODE h$(x)-48-7
*(CODE h$(x)>=65)
1020 LET byte=0
1030 RESTORE 2000
1040 READ start
1050 READ h$
1060 IF h$="*" THEN  GO TO 1160
1070 IF LEN h$<>2*INT (LEN h$/2)
 THEN  PRINT "Odd number of hex
digits in: ";h$: STOP
1080 FOR i=1 TO LEN h$
1090 IF NOT ((h$(i)>="0" AND h$(
i)<="9") OR (h$(i)>="A" AND h$(i
)<="F")) THEN  PRINT  "Illegal h
ex digit: ";h$(i): STOP
1100 NEXT i
1110 FOR i=1 TO LEN h$ STEP 2
1120 POKE start+byte,16*FN p(i)+
FN p(i+1)
1130 LET byte=byte+1
1140 NEXT i
1150 GO TO 1050
1160 PRINT "Code entered"
1170 PAUSE 150
1180 RETURN
2000 DATA 60000,"0608","210040"
2010 DATA "110018","CB3E","23"
2020 DATA "1B","7A","B3","20F8"
2030 DATA "10F0","C9","*"
```

Figure 6

So, if we take the binary number

00110100b = 52 ((1*4) + (1*16) + (1*32))

and shift all the bits to the left, we get

01101000b = 104 ((1*8) + (1*32) + (1*64))

We can do that in Z80 using the instruction

SLA reg (reg = A,B,C,D,E,H or L)

SLA stands for Shift Left Arithmetic — not a particularly memorable mnemonic, I'm afraid. If a '1' — that is, a set bit — is shifted out of the top position, then it is lost — to the carry flag — and a zero is always shifted into

```
42 LET p=INT(8*RND)
44 LET q=INT(8*RND)
46 IF p=q THEN  GO TO 44
48 PAPER p: INK q
```

Figure 7

continued on page 56

continued from page 55

the lowest bit. The only other left-shift instruction is

SLA (HL)

which shifts the contents of the location addressed by the HL register pair.

We can do exactly the opposite of this using the SRL — Shift Right Logical — instructions. Just to confuse matters further, there are similar SRA — Shift Right Arithmetic — instructions. Those are almost the same as SRL, but instead of moving a zero into the top bit, that bit remains unchanged. Figure two may explain that better, and all the instructions are shown in figure nine.

So what can we use those instructions for? Well, they have obvious uses for multiplication and division, but the assembly code in Figure Three shows a more interesting application.

All the characters which you see in the display file are held in a series of bytes. Those start at location 4000h — h = hex, 16384 in decimal — and continue to location 57FFh, or for 6144 locations. Each character in this display area is made up from eight bytes.

Figure four shows the arrangement for the letter A. If we were to shift all the bytes in the display file to the right, then all the characters would be displaced by one bit. If we did that eight times, then the characters would slowly disappear!

A Basic program to perform this professional-looking screen clear is shown in figure five. Try this out first. When you run it, you may be forgiven for wondering why nothing is happening. The screen is in fact clearing, but very, very slowly.

Now type in the program in figure six which loads the equivalent machine code routine. If you typed in the Attribute Fill routine last month, then you will be able to modify it, because the data — line 2000 onwards — is all that has changed. This program works quite a bit faster.

If we go back to the assembly code — figure three — we can see how the program works. The B register is loaded with the value eight, because we want to shift the screen to the right eight times to clear it. The main loop then starts by loading the HL register pair with the first screen location, and the DE register pair with the number of bytes on the screen which need to be changed.

The loop from label SHIFT is then executed 6144 times. This loop performs the necessary SRL instruction, then increments the HL register, so that HL eventually moves through the entire screen. Do not worry about how the loops work just at the moment — we'll be looking at those next month.

You can easily include the routine in you own programs. Not only does the screen clear in an unusual manner, but none of the attributes are changed. If you add the lines given in figure seven to the program, which just colour each character square, you will see that the colours are left unchanged. You could subsequently set those using PAPER and CLS, or even use last month's Attribute Fill routine.

The routine is easily modified to perform slightly different functions, too. Change the data value "CB3E" (line 2010) to "CB26". That is the code for "SLA (HL)", which will perform a similar shift, but to the left.

Z80 has a couple of interesting instructions which will rotate bytes. They work in a similar way to the shift instructions, but instead of a zero bit being shifted into the byte, the 'lost bit' is used — see figure eight. Try changing the "CB3E" data to "CB06" or "CB0E", and change line 80 to "GO TO 70", and see what happens.

Next month we will see how the loops which we have been using are formed, then use that knowledge to implement a digital counter on the screen, where the digits rotate properly into their correct positions, just like a real digital clock.

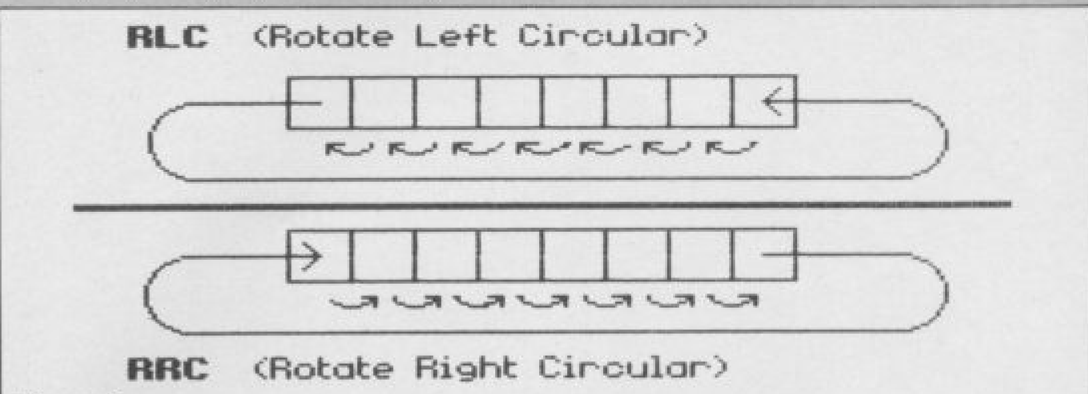


Figure 8

Figure 9: New Z80 instruction codes

INC	reg	— add one to the specified register.
INC	rp	— add one to the register pair.
INC	(HL)	— add one to the location addressed by the HL register pair.
DEC	reg	— subtract one from register.
DEC	rp	— subtract one from register pair.
DEC	(HL)	— subtract one from the location addressed by the HL register pair.
ADD	A, byte	— add the given byte to the contents of the A register.
ADD	A, reg	— add the value of the given register to the A register.
ADD	A, (HL)	— add the contents of the byte location addressed by the HL register pair to the A register.
ADD	HL, rp	— add the value of the specified register pair to the HL register pair.
SUB	byte	— subtract the given byte from the A register.
SUB	reg	— subtract the contents of the register from the A register.
SUB	(HL)	— subtract the contents of the byte location addressed by the HL register pair from the A register.

In the following four operations, the bit shifted out of the byte goes to the Carry Flag, and the bit shifted into the byte is zero.

SLA	reg	— shift the contents of the register left by one bit.
SLA	(HL)	— shift the contents of the location addressed by the HL register pair left by one bit.
SRL	reg	— shift the contents of the register right by one bit.
SRL	(HL)	— shift the contents of the location addressed by the HL register pair right by one bit.

The next two operations are exactly the same as the SRL equivalents, except that the most signifcant bit is unchanged, rather than being replaced by zero.

SRA	reg
SRA	(HL)

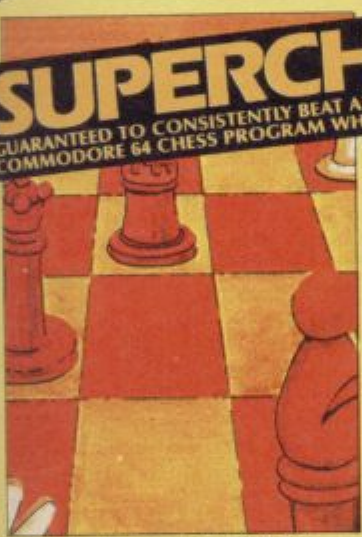
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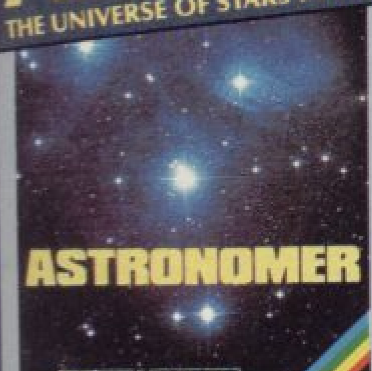
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WALLY programmers all live near the flight path of a major British Airport. Gatwick would be ideal because of its association with wally holidays, but the surrounding countryside is far too pretty for the machine-orientated wally minds. Hence the Mikro-Gen wallies hang about near Heathrow.

Choosing the correct site for a wally programming operation is of vital importance. Spacious air-conditioned hi-tech offices may lead to the Psion syndrome, where the very surroundings inhibit the creation of anything less cerebral than **Scrabble**.

Mikro-Gen programming is done in a large room over a high street shop in Bracknell. The approach is made from the back to save visitors embarrassment if their friends should spot them dropping in on the wallies. The rutted grass track is surrounded by dilapidated huts of the type erected by wally gardeners on suburban allotments.

A wrought-iron fire escape leads to the Mikro-Gen office, sheltered from the rain by transparent corrugated plastic. Inside cardboard walls in tasteful pastel shades give onto the main room, which is full of computers and happy programmers. There are very few chairs, a wally management technique to keep production moving.

Wally computers

Any home computer is a potential wally computer, but the important thing for wally programmers is that all games should involve the use of at least one incredibly expensive piece of equipment which can be casually shown off to visiting wally-watchers. Mike Meek, managing director of Mikro-Gen, has perfected the art.

"Incidentally, we don't allow smoking in the room because of The Minstrels," says Mike. Not the subtle use of the letter 's', implying there is more than one of the machines about. "We do the program development on the Minstrels," he explains, "and download into the Spectrum or Amstrad using cross-assemblers."



Then comes the kill. "Being engineers, we can maintain sophisticated machines, a great advantages." Like the folks who drive customised Ford Capris up and down Orpington high street on a Sunday afternoon, wally programmers

insist on the value of DIY maintenance.

Wally games

Mikro-Gen was formed in 1981 but it was with the appearance of Wally Week that the company fortunes took a dramatic turn for the better. Wally is the flat-capped, beer-gutted character who stars in **Automania**, **Pyjamarama**, and **Everyone's a Wally**.

It was not the first time Mikro-Gen had introduced a wally into its games, however. You may still remember the cult adventures **Mad Martha** and **Mad Martha II** in which Henry had to avoid his psychopathic wife for a night on the town and later a spot of infidelity on holiday with Spanish senoritas — definitely early wally territory.

Earlier still Mikro-Gen had been responsible for the creation of the Bomber-type game in **City Defence**, and a number of space games such as **Space Zombies**. But the shift from writing games for wallies to games about wallies has proved immensely successful.

Automania introduced two important wally concepts — penny-pinching and motor cars. Wally has to assemble the parts of a motor car, but the shelves in his garage are so old and rotten that bits keep falling off.

Pyjamarama took Wally into the home on an expedition for a midnight snack. Compulsive eating and the lurid primary colours of the graphics display wally domestic lifestyle in all its glory.

The third in the Wally trilogy, **Everyone's a Wally**, introduced a whole suburb of wallies involved in an intricate quest, and the title sums up the development of wally philosophy at Mikro-Gen.

Wally graphics

Wally programmers are particularly interested in graphics — the more the better. Ultimate calls its **Knight Lore/ Alien 8** graphics 'filmation'. New Generation has been known to talk about 'isometric' graphics while Hewson Consultants went through a period of calling everything 3D Space Wotsits. Mikro-Gen people talk about replacement graphics, which means Wally Week can move behind objects in **Everyone's a Wally**, whereas in **Pyjamarama** his legs and belly tended to change colour.

Here is technical director Andrew Laurie putting the phrase into context. He is explaining why Mikro-Gen games look better on the Spectrum than on the Commodore 64, which is supposed to have superior graphics.

"You can make the software outdo the Commodore hardware because every last bit of the Spectrum is used up with replacement graphics. The resolution of the multi-coloured sprites on the 64 is very poor."

Animation is an important factor in any wally game. Take **Herbert's Dummy Run**, the latest from Mikro-Gen. "Herbert has a six-stage walk on the Spectrum but only four on the C64, as there is a limit on the sprite pointers. We hope to double that. Those sprites are unacceptable to us on the Commodore and some people might get disappointed."

Seeking inspiration

Great wally games do not come unbidden to the mind during a Monday morning bath. They are the result of painstaking research in the backwaters of wally computerland. After all, as Mike Meek explains over a cheese sandwich and a pint of lager, he and Andrew did not go into computing for the simple fun of it.

"We started Mikro-Gen to make money," he states bluntly. The belief that somewhere out there are millions of pounds waiting for the first programmer to hack Matthew Smith's bank account is, of course, central to the wally software industry.

"We get various ideas from clubs," says Mike. "Andrew was a founder member of Sunbury Computer Club six years ago." Andrew then proudly describes how he once built a 256-byte micro with binary switches. That is the sort of pedigree which really sorts out the true wally from the run-of-the mill Porsche poseurs and Hobbit hackers.

In fact, the Bomber game was written by a club member for the Commodore PET. "He helped us do it for the ZX-81," says Andrew.

It is only recently that Mikro-Gen started hiring full-time programmers. "Before **Automania** most of the programming was sub-contract," says Mike. He explains that by doing it that way you avoid having to pay programmers' salaries when they are not producing anything, or when the money gets tight. Other areas of inspiration are also utilised.

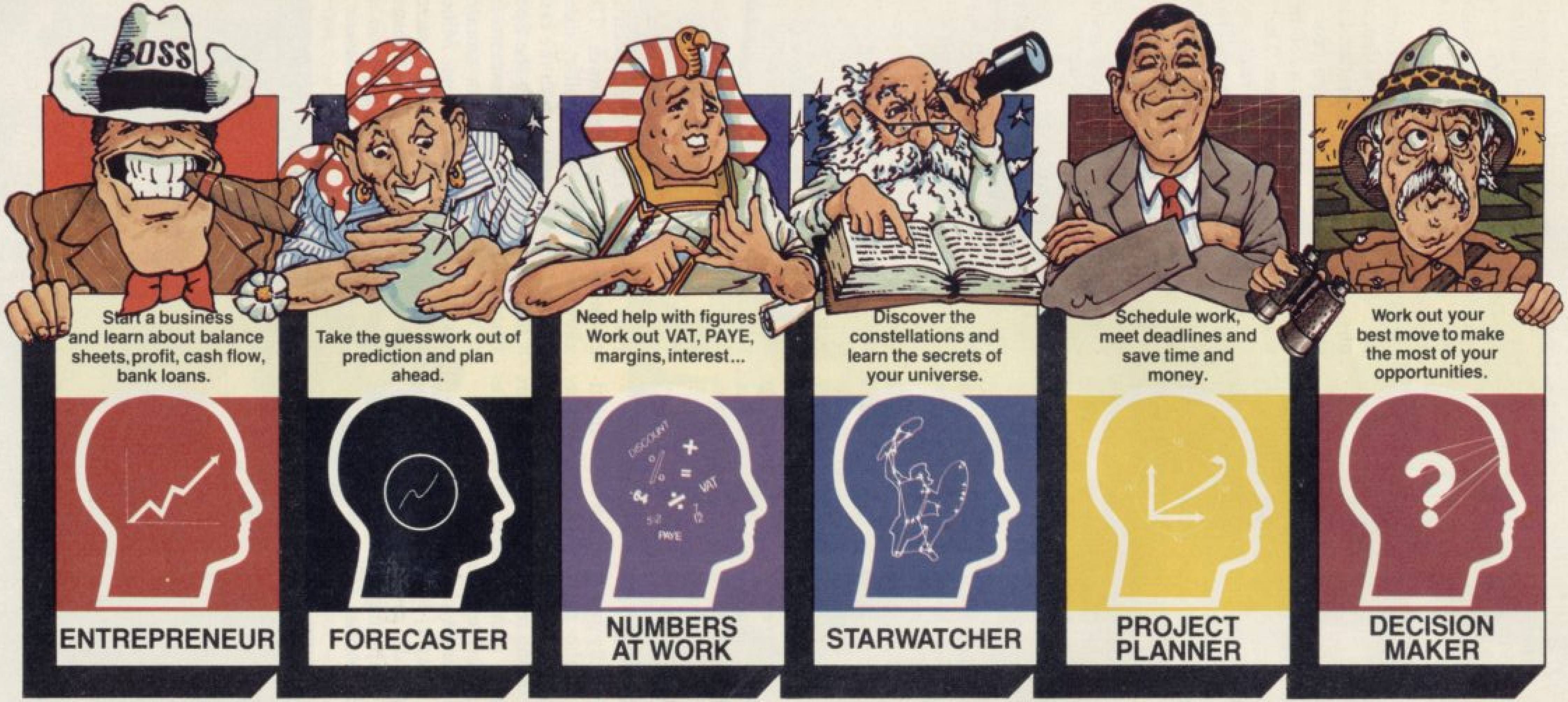
1 — ZX Microfairs. "We were at the first ZX Microfair," says Mike. He talks about the roots of the trade'. Mike also used to run the Sinclair User Club — you can't get much rootier than that.

2 — The Shop. Mikro-Gen also runs a shop, part of the Spectrum chain of home computer stores. That allows the Mikro-Gen wallies direct contact with the wallies with the cash. "The Amstrad is outselling the Spectrum in our shop at the moment. It's very good value for money," says Mike. Hence Mikro-Gen plans to convert games for the Amstrad to cash in on the

continued on page 61



This is a wally caption. It fills space. Sort of.


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STARWATCHER
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PROJECT PLANNER
Work out your best move to make the most of your opportunities.
DECISION MAKER

continued from page 59

revolting machine's success.

"The problem with a software house being a closed group is that you can miss certain points or even be on the wrong path," says Mike. If ever there was a herd instinct, wallies have it. For a wally to be on the wrong path, isolated from his fellows, is to risk losing everything wallyhood stands for.

Chartbusters

Wallies are inveterate chart watchers. Sporting wallies love constructing World's Best teams with the aid of the obligatory *Guiness book of Records*. Mikro-Gen also follows the charts. "We were very chuffed to see **Everyone's a Wally** knock **Alien 8** off the top," crows Mike.

Such talk frequently leads to interminable discussions concerning which charts are the most reliable and what the figures signify.

"Overall, **Pyjamarama** has sold best, but **Everyone's a Wally** will probably surpass it. It surpassed our initial projections faster than any other program." Mike goes on to explain how the new game will 'ramp' shortly after its release.

Talk about 'sales projections' and 'ramping' may bore readers but they are essential parts of the vocabulary for wallies hoping to make a determined assault on the software charts.

The Forces of Evil

The latest addition to the wally stable is **Herbert's Dummy Run,** set in a gigantic department store full of the sort of fancy lampshades and other useless bric-a-brac so beloved of domesticated wallies. Herbert is Wally's infant son, who becomes lost in the department store. "**Everyone's a Wally** veers strongly towards adventure," says Mike. "Herbert veers towards arcade."

Promoting a game properly is an important factor in becoming a successful wally programmer. The Wally Week games had promotions involving a rally car, but Herbert is too young to drive.

Instead, Mikro-Gen hit on the idea of sending disposable nappies to important people in the trade with 'There's a big one coming your way' printed on them. Another legend reads, 'Only Herbert can fill this space'.

Mere charlies or berks cannot hope to achieve the heights of artistic taste aspired to by true wallies.

Good taste is not enough, however, and plans are afoot for an even more spectacular game. Mikro-Gen has commissioned a non-wally to write a fantasy novel on which a game will be based.

"Things are fairly dynamic at this point," says Mike, meaning little has been decided for sure. He reckons the book will, "introduce a far greater depth of understanding into the program, building up pictures in the mind."

Since the average wally mind is supposed to be entirely empty of everything except Toby bitter and patent spray-on anti-rust liquid, the game is clearly not intended for the purist wally market. Instead it is aimed at the hybrid adventure market.

"It will be **Lords of Midnight**-ish but animated," explains Andrew, "with graphics to the same level as **Pyjamarama**."

Mike Meek acquires a wistful look in his eyes as he thinks of the moral possibilities. "It will be a battle against various evil forces. If it's successful it will be a classic."

The evil forces remain vague and undefined as yet, but may well include traditional enemies of wally software people such as US Gold or Jeff Minter.

"We represent enough force in the market now to make some people look at it," announces Mike, ominously.

Presumably if it is not successful it will not be a classic. The philosophy of wally programming is arguably encapsulated within that sentence.

Serious programs

It is important that wally software houses should have at least one 'serious' piece of software with which to counter accusations that they are only in it for the money.

Mikro-Gen have **Air Traffic Control,** programmed by former air traffic controller Dale McLoughlin, who freelanced for Mikro-Gen. Mikro-Gen claims the program is being used to train real air traffic controllers, and Dale goes so far as to say many play it when they get home from work.

Air traffic controllers are clearly wallies also, a comforting thought.

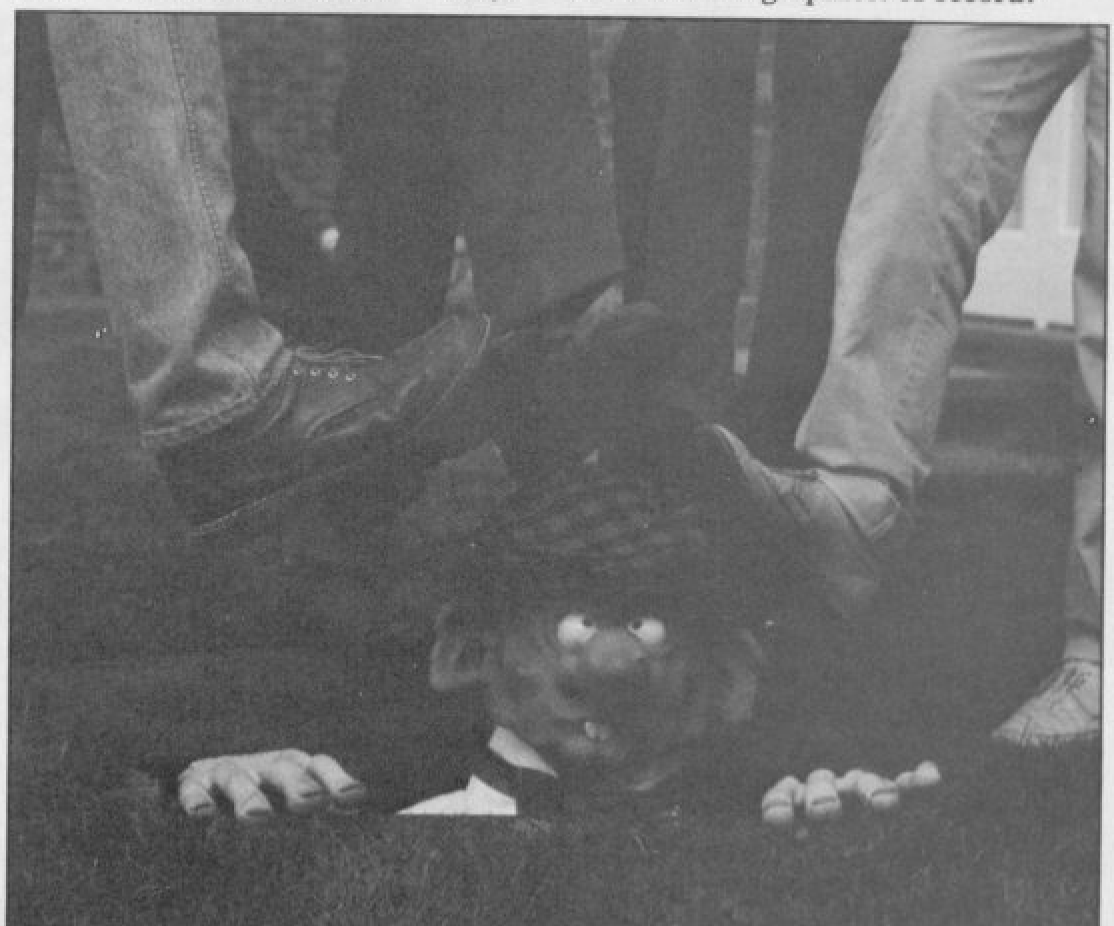
The Invisible Man

Chris 'Rudolph' Hinsley joined Mikro-Gen on January 1 1984. "He is always criticising me because he never gets mentioned," Mike admits.

All software companies have at least one person who does all the work and never gets the credit. Another such at Mikro-Gen is Anthony Lill, who has just joined the company and is "still thinking in binary" as opposed to not thinking at all.

Final thoughts

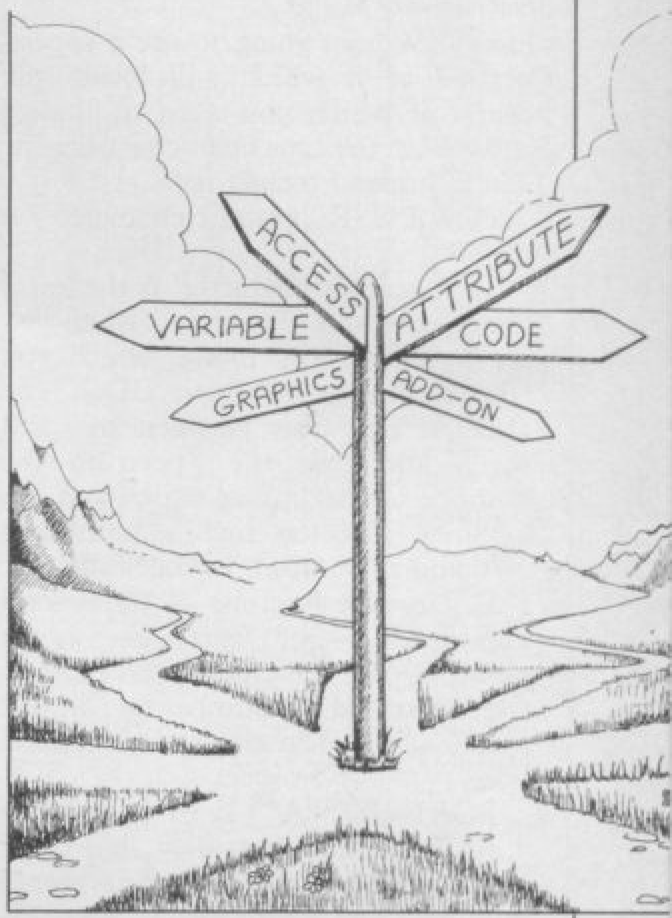
Herbert's Dummy Run uses 1250 user-defined graphics. A record?




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Defining designing

This month our course for beginners is concerned with DIY characters. John Gilbert explains in graphic detail



USER-DEFINED graphic (UDG) manipulation is one of the most misunderstood aspects of using the Spectrum.

A UDG is an addition to the normal alphanumeric character set but one which can be created by you, the programmer. It can be used to create a plethora of aliens and space craft or, more usefully, to display foreign alphabets and symbols.

Last month we looked at how the computer represented information as numbers and how the letters of the alphabet, punctuation marks and symbols are stored in numeric form. The same is true and each of the UDGs has a character code which can be found in an appendix at the back of your user manual. The codes are 144 to 164 and in the manual they are shown as lowercase letters enclosed in brackets.

If you use a little of the knowledge that you picked up from last month's article you could use the CHR$ function to display a UDG representation as it is when the Spectrum is first powered up. Type PRINT CHR$(153).

A capital J should be displayed at the top of the screen as the Spectrum initially represents its UDGs as capitals. You will be changing them later.

The standard, non-changeable character set is stored in the unchangeable ROM. As it must be possible to change the design of a UDG each of those characters is stored in a special area of RAM. If you look at the chart labelled 'memory map' in your user manual you will see that the UDG area starts at the RAM address 32600. As shown in the character set table only the characters 'a' to 'u' area are stored there and it is usually possible to use only 21 UDGs at one time.

As with all data within the Spectrum, UDGs are stored as a series of ones and zeros. Figure one shows how each character is made. Each box can contain a one or zero. If a one is present a part of the box is inked in. If a zero is shown then a space is put into the box.

Characters are formed of eight lines with eight boxes to a line and it is easy to represent them on paper in the way shown in figure one. That is not, however, the way in which UDGs are represented in RAM. Figure two is a simplified explanation of the layout of the first two lines of the character in figure one as they would appear in RAM.

There are three steps to creating and displaying a UDG.

1. Use the grid in figure one as a template for your new character. Ink in the squares which you want to be inked in and leave the others blank.

2. Reduce each of the eight lines to a number consisting of eight ones or zeros, depending on where the black boxes lie. For instance, if there are two inked squares at the left of a line and the other boxes are blank the number would be 11000000. List the numbers on a piece of paper.

3. Time to introduce some new commands and program your character into the computer. I expect that you have had little use for the POKE command before but now it comes in

continued on page 64

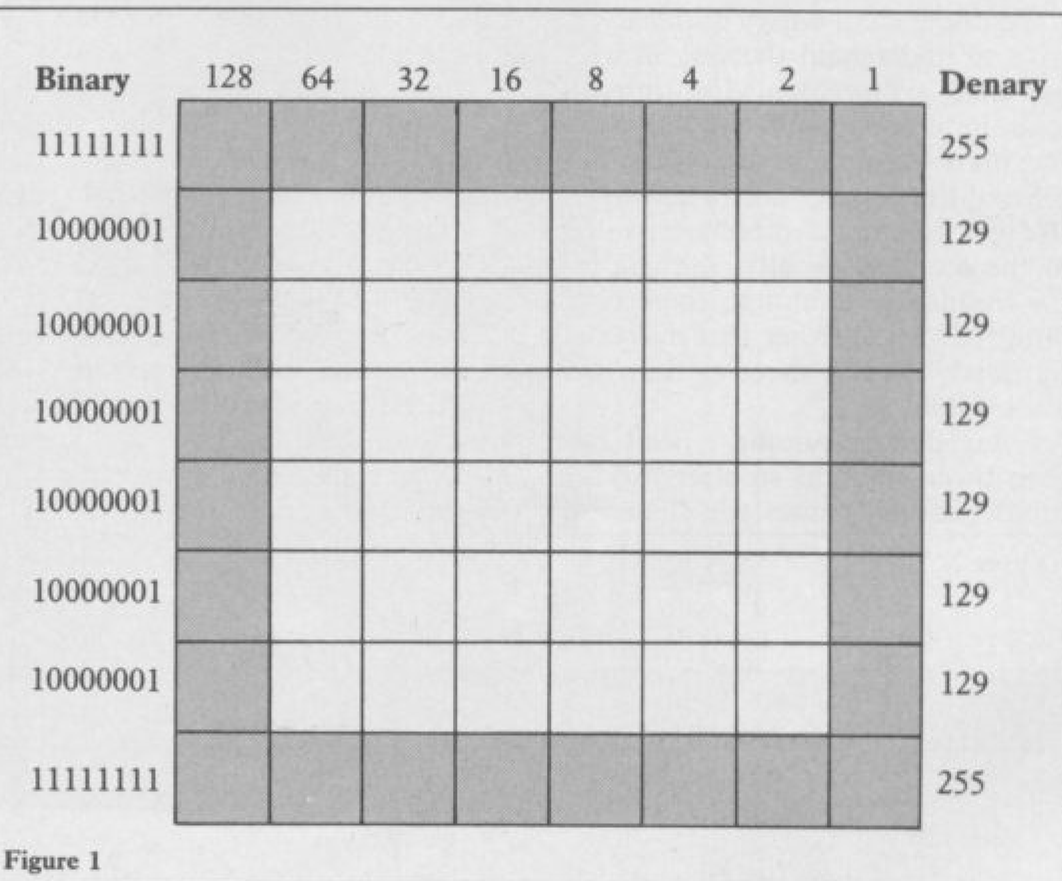


Figure 1

continued from page 63

handy. We are going to use a special version of it which will locate the character which you want to change and set up the new character using it. The command format is:

POKE USR "graphic character" + offset

The 'graphic character' is the letter between A and U, entered when you are in GRAPHIC mode, which you wish to change into your UDG. The offset is a number between zero and seven and tells the Spectrum the number of the line at which you are looking. The top line is numbered zero and the bottom is line seven.

Let us take line one — the second line down — of figure one as an example. We will change the UDG to the square and the number for line one is 10000001. The finished command is:

POKE USR "A"+1, BIN 10000001

An extra function, BIN, has crept into that line. The number is a binary number, a system which was explained last month. We must tell the Spectrum that the value represented is not decimal so the function BIN is put before it.

It is, however, possible to convert the ones and zeros of the binary number to the decimal system and use it within the POKE USR statement. In order to do that you must be able to convert a binary number into a denary one as denary is base 10 — ie units, 10s, 100s — and binary is base two — 1,2,4 and so on.

To understand binary or denary you have to understand the way in which numbers are written. For instance, take the number 123. The three is in the units column so there are three units of the number one. The two is in the tens column so there are two tens in the number. Finally, the one is in the hundreds column so there is one hundred. All together that makes one hundred, twenty, three as the Americans would say.

Some denary numbers need more than three columns so after the hundreds position comes the thousands, ten thousands and millions. The same is true of binary but, just as you cannot put a 10 into the units column in denary, you cannot put a two into the units — or one — column in binary.

The binary scale is shown at the top of the block in figure one, ranging right to left. The way to convert a binary number into denary is to look from right to left and every time you come across a one, or inked block, add the number of the column to a running total. For instance, the second line down in figure one has ones in the '1' and '128' columns so the denary value of binary 10000001 is 1+128=129.

If you do that for each of the lines you will end up with eight denary numbers. You can put them in the POKE USR statement without BIN. To store the second line down of figure one in the 'A' UDG space, type:

POKE USR "A"+1, 129

Type in the line as a direct command and when you go into GRAPHIC mode and type 'A' the result will be a mutated 'A'. Alternatively you could save having to go into GRAPHIC mode and use CHR$ to print out the new character.

PRINT CHR$(144)

There are two programs this month and those show the two ways of entering UDGs within a programming environment. The first uses the long-winded BIN way and the second translates those long binary numbers into decimal.

We have not finished with UDGs. Next month we will explore the realms of animation with them.

Program 1

```
10    CLS
20    RESTORE
30    FOR K=0 TO 7
40    READ A
50    POKE USR "A"+K, A
60    NEXT K
70    PRINT "DEFINITION COMPLETE"
80    PRINT "AAAAAAAAAA AAAAAAAA"
90    DATA BIN 11111111, BIN 01000010, BIN 00100100
100   DATA BIN 00011000, BIN 00011000, BIN 00100100
110   DATA BIN 01000010, BIN 11111111
```

Lines 10 and 20 clear the screen and make sure that the computer RESTOREs all the data in the program. It will start to READ data from the first DATA line at line 90 when requested.

Line 30 starts the loop, the contents of which will READ in the UDG definition and perform the transformation. The loop will execute eight times, zero to seven.

Line 40 READs in a DATA definition and line 50 puts, or POKEs, it into the relevant section of the character you are re-defining, ie 'A'.

Line 60 ends the loop.

Line 70 tells the user that the definition of the UDG is complete. Line 80 underlines the message. Remember that the 'A's should be entered in GRAPHICs mode.

Lines 90 to 110 define the DATA which is to be use in configuring the new UDG. Note that it is in BINary format. You could make line 500 read 50 POKE USR "A"+K, BIN A if you want. By so doing you could remove all those troublesome BIN words from the DATA statements as line 50 would convert the numbers to BINary automatically.

Program 2

```
10    CLS
20    RESTORE
30    FOR K=0 TO 7
40    READ A
50    POKE USR "A"+K, A
60    NEXT K
70    PRINT "DEFINITION COMPLETE"
80    PRINT "AAAAAAAAAA AAAAAAAA"
90    DATA 255, 66, 36
100   DATA 24, 24, 36
110   DATA 66, 255
```

Lines 10 and 20 clear the screen and RESTORE the DATA.

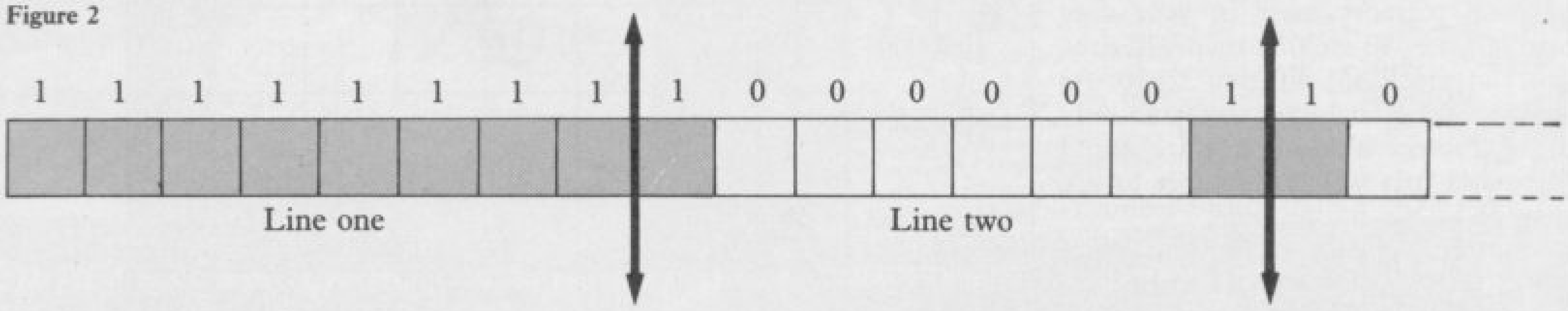
Line 30 loop for character definition.

Line 40 reads the DATA for part of the character while line 50 creates that section and line 60 ends the loop.

Line 70 prints the definition ends message and line 80 underlines it with the new UDG.

Lines 90 to 110 contain the DATA. It has been converted to a denary format and there is no need to use the BIN statements either in the DATA lines or at line 50.

Figure 2



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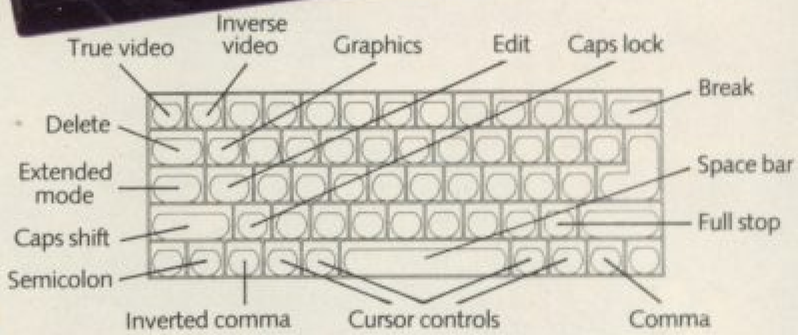
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The painless way to programming

We present a set of routines by David Wright to take the torment from Basic

PROGRAMMING in Basic can be torture if you are trying to write a long program full of subroutines and complicated little twists.

Perhaps there is not enough room between existing lines for that extra few instructions you need to get rid of an error. Perhaps you have forgotten where all the GOTO statements were for a line whose number you have changed. Such minor problems waste time and irritate the soul, leading to more errors through impatience and fatigue.

Table 1. Available routines

#R — Renumber
#A — Add
#S — Subtract
#C — Copy
#D — Delete
#L — Lines Auto
#F — Find
#V — Variables

David Wright's **Easyedit** utility takes the strain out of programming by providing eight extra commands which complement the Spectrum's editing facilities. It occupies a little under 4½K of RAM and is stored above RAMTOP, set at address 60701.

Written in full machine code, it uses interrupt routines which enable each command to be accessed at any time during programming by pressing the appropriate keys. Each command starts by pressing #, and a full list is given in table one for easy reference.

Loading the code

Type in the Basic program in list one, and make sure all the data is entered using capital letters. Save the program before you RUN it, and then RUN the program. As each line of data is read, a check is made, the checksum being the last two digits of the line, which is the remainder of the sum of the first twenty-two items divided by 256.

When you finally receive the message "EASYEDIT now loaded" you can save the code with SAVE "EASYEDIT" CODE 60702,4664 and verify with VERIFY "EASYEDIT" CODE 60702,4664. If you have microdrives, type POKE 63132,4 beforehand to make sure there is always enough space to open a microdrive channel.

You switch the program on with RANDOMIZE USR 60702. When LOADing the code back into the machine, enter CLEAR 60701 first, to protect the code above RAMTOP.

What follows is a brief description of the various facilities offered by **Easyedit**. All the commands will prompt you for further input. The program also includes 31 new error codes to handle incorrect inputs to be found in table two.

Renumber

This renumbers the program or part of it in regular steps. The size of the step, or increment, should be from 1 to 255, and you then enter the first and last line numbers of the block to be renumbered, and the number for the new first line.

By pressing ENTER instead of inputting a value the whole program is renumbered in steps of 10. The routine will handle GOSUB, GOTO, RESTORE, RUN, LIST and LLIST but not LINE. If you use something like GOSUB a*10, the routine will print out such expressions and tell you the new line number, but you must edit them in the normal way.

Add/subtract

This enables you to add or subtract a number from 1 to 9999 from every line number in a specified block of program. It is particularly useful if you have a program with many GOSUB expressions using variables instead of numbers, because the relative gaps between lines remain the same. In all other aspects, the routine works the same as the RENUMBER routine.

Copy

This copies one part of the program to another, enabling you to duplicate sections elsewhere in the program. Apart from the line numbers of the new block, the program is not changed.

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Table 2: New error codes

Routine	Error	Circumstance
LINES AUTO	01	first line = existing program line number
	02	next line number too large
RENUMBER	03	too many digits input
	04	more than three digits in increment
	05	increment greater than 255
	06	increment = 0
	07	line number = 0
	08	first line number greater than last line number
	09	no basic program found
	10	actual line numbers coincide
	11	increment too large for available space
	12	new first line too small
	13	new first line greater than actual line number after last line
	14	new first line = actual line number after last line
	15	too many lines in block to fit into gap even with increment=1
ADD/SUBTRACT	16	no default for increment
	17	add increment too large
	18	subtract decrement too large
FIND	19	more than 16 characters/tokens input
DELETE	20	no default for first line number
	21	first line number greater than last line number
	22	no lines in block or single line number does not exist
	23	first line number greater than actual last line in program
COPY	24	no default for new first line
	25	new first line coincides with actual program lines number
	26	new first line within block to be copied
	27	new last line number in block greater than 9999
	28	new last line number too large
	29	insufficient space to copy block
RUN ERROR	30	free space becoming too small
	00	free space too small on calling routine

Note that some of the renumber errors occur with the other routines. The circumstances under which those errors occur are the same as those described.

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Delete

This allows you to delete a block of program. It also asks you to confirm your choice, as the lines deleted cannot be recovered.

Lines auto

This generates new line numbers automatically when writing the program. To exit, press ENTER immediately after the new line number is generated. The routine will stop if it reaches a number where there are already existing program lines, to prevent you from inadvertently interlacing the new lines with the old. You cannot use the other routines in conjunction with LINES AUTO.

Find

An extremely powerful command. It allows you to input up to 16 characters, including keywords, graphics and tokens. All lines in which the chosen expression occurs will be printed on the screen with the relevant expression flashing. Use CAPS SHIFT and 9 to change the cursor mode when entering the expression, to get the appropriate characters or words.

You could use the routine to find all occurences of a particular GOSUB statement which you had assigned the wrong number. Or you could use it to check that you had not used a particular variable earlier in the program.

Letters are printed in upper and lower case depending on whether CAPS LOCK was used before entering the routine. That does not matter as the routine does not distinguish between the two.

Variables

This tells you the values of system variables PROG, VARS, ELINE and RAMTOP if you know about such things. It also tells you the length of the Basic program, variables area, and the remaining free space.

New

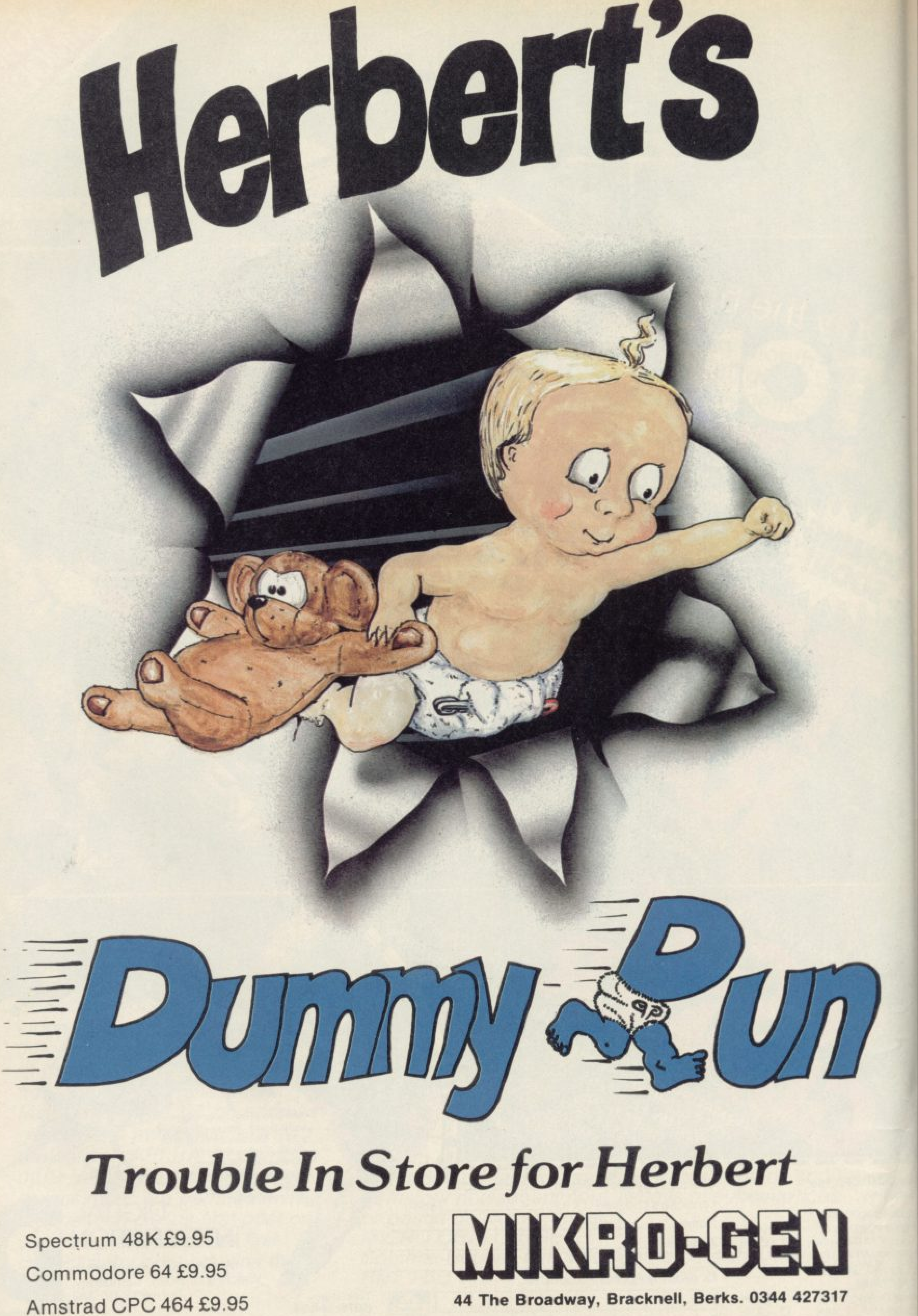
The ordinary NEW command will deactivate the code routines, so **Easyedit** replaces it with a routine which deletes lines 1 to 9999 of any Basic program.

*The **Easyedit** routines were assembled with the aid of the Zeus Assembler from Crystal Computing.*

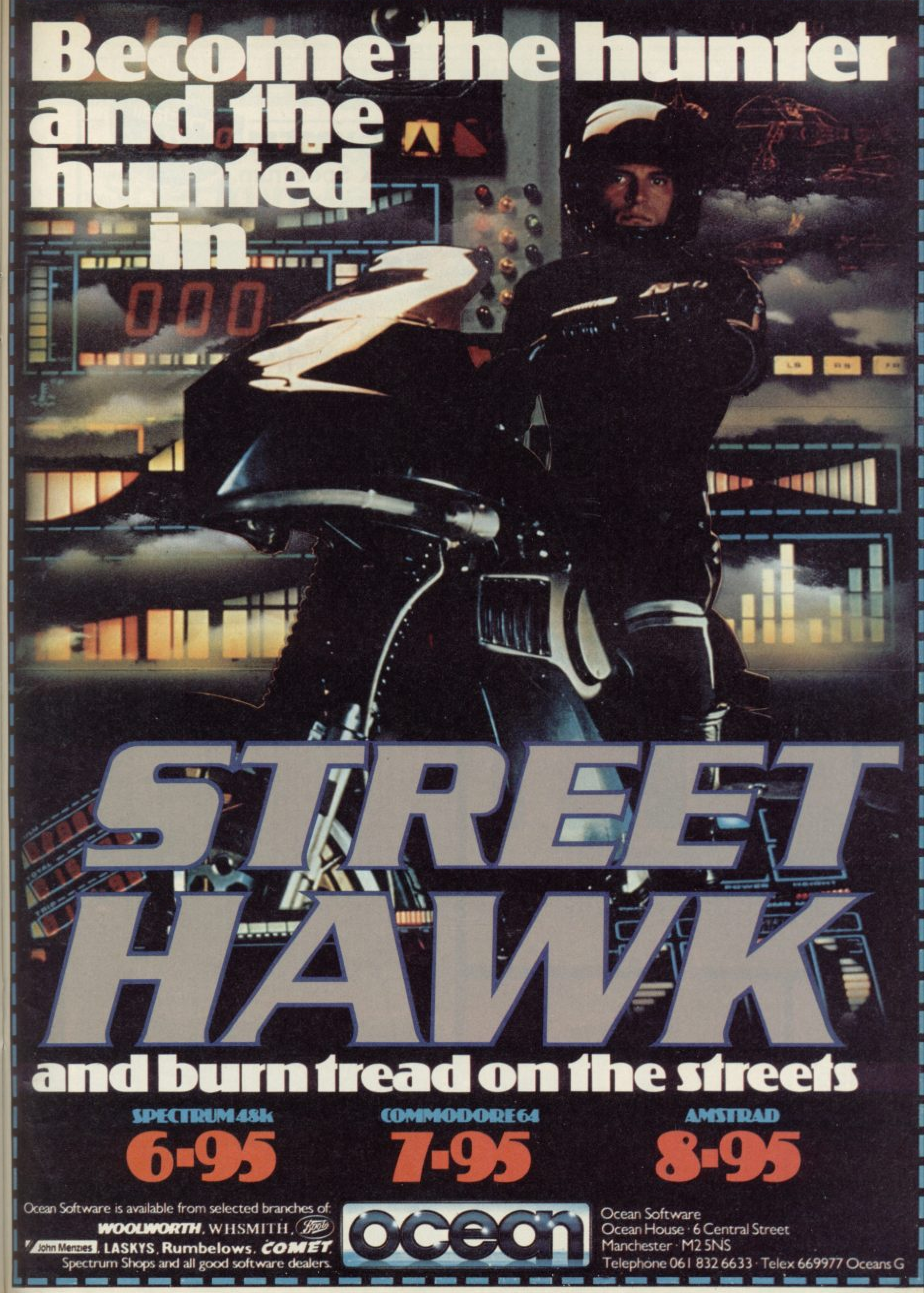
```
  10 CLEAR 60701
  20 LET line=1000: LET adrs=607
02
  30 FOR i=1 TO 212
  40 READ a$: POKE 23692,255: PR
INT "Reading data line ";line
  50 IF LEN a$<>46 THEN  PRINT "
Data length error line ";line: S
TOP
  60 LET check=0
  70 FOR j=1 TO 43 STEP 2
  80 LET w=CODE a$(j)-48-7*(CODE
 a$(j)>57)
  90 LET w=16*w+CODE a$(j+1)-48-
7*(CODE a$(j+1)>57)
 100 POKE adrs,w: LET adrs=adrs+
1: LET check=check+w
 110 NEXT j
 120 LET w=INT (check/256): LET
check=check-256*w
 130 LET w=CODE a$(45)-48-7*(COD
E a$(45)>57)
 140 LET w=16*w+CODE a$(46)-48-7
*(CODE a$(46)>57)
 150 IF check<>w THEN  PRINT "Da
ta error line ";line: STOP
 160 LET line=line+10
 170 NEXT i
 180 PRINT "EASYEDIT now loaded"
: STOP
1000 DATA "F3F53EF6ED47F1ED5EFBC
9F3F53EF6ED47F1ED5EC9F59A"
1010 DATA "3E3EED47F1ED56FBC9237
EFEEA2858FEFAC254ED237E4D"
1020 DATA "CDB618FECBC248ED237EF
EED2846FEEC2842FEE5280DC1"
1030 DATA "FEF02809FEF72805FEE1C
27CED237EFE0D2828FE3A28A7"
1040 DATA "C628C39EED7ECDB618FE0
D2818FE3A28B6FE21DA3DEDDC"
1050 DATA "FE2223C27BED7EFE2223C
292ED18E021000022B1FDC921"
1060 DATA "EBDD21BBFDDD36002FDD3
6012FDD36022F01E803CD3F62"
1070 DATA "EE016400CD3FEE010A00C
D3FEE3E3085DD7700C92A53DF"
1080 DATA "5C010100D5E5ED5B4B5CA
7ED52E1D13024C5E546234E54"
1090 DATA "6069A7ED52E1C13012C54
6234EED43D9FD234E23462312"
1100 DATA "09C10318D356235EC9ED5
BD9FD0BC96069D5ED5BCDFDFA"
1110 DATA "A7ED5222D3FDDA1EEE2AC
FFDED42D1D8ED5BD3FD3AC19F"
1120 DATA "FD21000006081FD231EE1
9A7CB13CB1210F4EB2ADDFDAA"
1130 DATA "19EBC9DD7E00C601DD770
0A7ED4230F609DD23C9010012"
1140 DATA "002A535CED5B4B5CA7ED5
2D282EE190356E5235EC5ED7A"
1150 DATA "43D1FDCD09EE3A89F03DC
C2FF0C1E1722373235E235654"
1160 DATA "231918D43A8FF03DCA98F
22A4B5C3680232259SCCDB070"
1170 DATA "163E0132885C2AB25C363
E2B3600F92B2B223D5C110396"
1180 DATA "13D521000022455C3E013
2475CFBCFFF3E0132885C7E7C"
1190 DATA "CD61EF2310F9060421BBF
D7ECD61EF2310F9C9CD09FD8F"
1200 DATA "FD364E012AAFFD56235EC
92A4B5CE52AB1FD23CD48F0AE"
1210 DATA "2B237EFE3A3004FE3030F
6CD48F02A4B5CD1A7ED522A43"
1220 DATA "B1FDC27BF1CDD3EED5CDA
2ED21B6FD060ACD71EF2AB187"
1230 DATA "FD7ECD61EFD13A845CE6F
0C60832845C3E0932885CCD63"
1240 DATA "CCEDED43D1FDCD09EE3A8
9F03DCC2FF0CDA2ED21BAFDBA"
1250 DATA "0606CD71EFCD29ED2AB1F
D237ECDB618FE0DCA7BF1FE6F"
1260 DATA "3ACA7BF12318EFE5213B5
CCB8E23CB86C5CDF409C1E135"
1270 DATA "C97E23CD61EF10F9C9E56
26B29291929D6305F16001933"
1280 DATA "EBE1C93A885CFE16CA9BF
3FE0CCA9BF3FE07CA9BF3CDAB"
1290 DATA "BEEFCBBE21D5FD3521885
C343E20E521845C35CD61EF2D"
1300 DATA "35E134CDBEEFCBFE04C39
BF3F521215B3A895C2FD6E77C"
1310 DATA "0F0F0F5F3A885C577B921
6005F19F1C9D6305F160023F4"
1320 DATA "7E05FE0D2805CD79EF18F
47990FE053E04D07AA73E057E"
1330 DATA "C07BA73E06C87B32C1FDA
FC978FE023E00328CF0D83C49"
1340 DATA "328CF048237E05FE0D3E0
0C87ED6305F1600237E05FE4A"
1350 DATA "0D2805CD79EF18F47AB33
E07C8AFC9ED4BD1FD2AE5FD3F"
1360 DATA "2BA7ED42D02AE7FDA7ED4
2D82AC3FD19EBC97EFE0DC895"
1370 DATA "FE0EC8FE21D0E5EB2A4B5
CA7ED522B444D626B23EDB093"
1380 DATA "2B224B5C2AAFFD23235E2
3561B722B73E118D30D0D3129"
1390 DATA "30300D0D300D0D3132313
60D06070809000030D070006D6"
1400 DATA "00004552524F522031300
B494E4352454D454E54203D18"
1410 DATA "1146495253542 0CA4F462
0424C4F434B203D114C4153F1"
1420 DATA "542020CA4F4620424C4F4
34B203D3E0132F5FD3D32F6A3"
1430 DATA "FD3AC1FD16005F3A89F03
D2009ED5BC5FD3E02328CF07B"
1440 DATA "CDA2ED3A8CF0FE0228052
1BBFD36203E1132895C21998E"
1450 DATA "F0060BCDBAEE3E1032895
CED5BC7FDCDA2ED21A5F006FF"
1460 DATA "11CDBAEEED5BCBFDCDA2E
D061121B7F0CDBAEE3A89F0F9"
1470 DATA "3D20182A535C56235E32C
1FDED53DDFD21010022CDFD3D"
1480 DATA "22CFFD181F3A89F0FE04C
AEAF7ED5BDDFDCDA2ED213054"
1490 DATA "FF0615CDBAEE3A89F0FE0
5CADEF9FD364E012A535CED2E"
1500 DATA "5B4B5CA7ED52D250EE192
2AFFD23232323CD3EED7CB594"
1510 DATA "200C2AAFFD23235E23561
92318DB237EFE0E280CFE3A67"
1520 DATA "D2E1EEFE3030F1C3E1EE2
AB1FD1EFF231C7EFE0E20F959"
1530 DATA "7B32B5FD22B3FD1106001
97EFE0DCACCF1FE21DC52F0AE"
1540 DATA "FE0DCACCF1FE3AC2E1EE2
AB3FD2323235E2356E5CDCCF3"
1550 DATA "EDED43D1FDCD09EE3A89F
03DCC2FF0E1722B73CDA2EDD7"
1560 DATA "06053E3021BBFD4E0523B
928FA3AB5FDB8CA7DF2C5F53A"
1570 DATA "F218F2CD83F64F3A8FF03
D2005F1C1C38DF2784190321B"
1580 DATA "C0FD2AAFFD23235E2356E
521C0FD4E0600626BD1F1F54B"
1590 DATA "D5F237F2091803A7ED424
44DE1702B712A4B5CED5BB334"
1600 DATA "FDA7ED52444D3AC0FD5F1
6002AB3FDF1F26DF21922B3EA"
1610 DATA "FD2A4B5CE519224B5CEBE
12B1BEDB8180FE5A7ED522260"
1620 DATA "B3FDEBE1EDB0ED534B5CC
12AB3FDDD21BEFD2BDD7E00DA"
1630 DATA "77DD2B10F72AB3FD16001
E0619C37BF13E1ECDCFF23E0A"
1640 DATA "02328FF03AC1FDA728173
E0132C1FD21010022DDFD2200"
1650 DATA "CDFD2AE1FD22CFFDC362F
1CDACF62A535C56235EED5335"
1660 DATA "DDFDC362F1F5AF3261FAF
1F52196F03630FE0A3805348D"
1670 DATA "D60A18F723C630773A895
CFE04301C21210422885C2159"
1680 DATA "805022845C0640C53E20C
D61EFC110F73E0432895C3EB7"
1690 DATA "0132885C2190F00608C57
ECD61EF23C110F7F1FE0BC8D3"
1700 DATA "FE13C8FE1EC8A7C8C389E
EF5CDAF0DF1CDB0162AB25CA0"
1710 DATA "2BF9CD0CFE264E2E493A8
9F0FE02200426452E44229955"
1720 DATA "F02175F022D5FD3E02328
DF03A89F0FE04F5DC61F8FE36"
1730 DATA "06CC61F8F1380CFE06280
83E03328DF0CD70F8CDBEEF33"
1740 DATA "CBFEAF328BF032EFFD32F
0FD328FF0CD83F63A8FF03D4F"
1750 DATA "CCCFF2CA89EE0605CD33E
```

```
DAF32085C3A085CA7CA9FF3AC"
1760 DATA "FE0DCACDF8FE0CCA89EFF
E3038E7FE3A30E32AD5FD77F1"
1770 DATA "2322D5FDCDBEEFCBBECD6
1EFCDBEEFCBFE10CCCD29ED39"
1780 DATA "CDBEEFCBBE3E03C3CFF2C
D29ED3E01328CF02A535CED5E"
1790 DATA "5B4B5CA7ED523E09D2CFF
23A89F0FE04CA63F7FE05CA68"
1800 DATA "63F73E0A32C1FD2A535C5
6235EED53C7FDED53DDFD2181"
1810 DATA "0F2722CBFD3A89F0FE03D
AAAF53A8BF047FE04CA75F47E"
1820 DATA "2175F0487E05FE0D2807C
DD8EFA7C2CFF2ED5BC7FDCD22"
1830 DATA "00F0A7C2CFF2ED53C7FDE
D5BCBFDCD00F0A7C2CFF2E5FA"
1840 DATA "ED53CBFD2AC7FDA7ED52E
13E08D2CFF2ED5BDDFDCD0085"
1850 DATA "F0ED53DDFDA7C2CFF23A8
BF0FE042006210A0022DDFD38"
1860 DATA "110F27CDCCEDED53DFFDE
D43E1FDED5BC7FDCDCCEDED76"
1870 DATA "53C7FD3A8CF0A72004ED5
3DDFDED43CDFDC5ED5BCBFD81"
1880 DATA "CDCCEDED53CBFDED43CFF
DE1A7ED423E0AD2CFF2ED5B64"
1890 DATA "DDFDCDCCEDED43E3FD2AC
DFD03A7ED423E0CD2CFF22A44"
1900 DATA "CFFD230BA7ED423E0DDAC
FF2200A2ADDFDED523E0ECA39"
1910 DATA "CFF2ED5BCBFDD513CDCCE
DE1A7ED52EB2003211027ED59"
1920 DATA "5BDDFDA7ED52E52ACFFD2
3ED5BCDFDED52EBE1ED523EB3"
1930 DATA "0FDACFF23E003288F0ED5
BCBFD210F27A7ED52280C1326"
1940 DATA "CDCCED2ACBFDA7ED52200
31110271B2ADDFDEBA7ED52B9"
1950 DATA "22DBFD110000ED53D7FD3
AC1FD570609A705CB1230FB31"
1960 DATA "CB1A3E1190471E00A7ED5
2300119E52AD7FD3FCB15CB26"
1970 DATA "1422D7FDE1A7CB1ACB1B1
0E62ACFFDED5BCDFDA7ED5241"
1980 DATA "EB2AD7FDED52D2CBF03A8
8F0A73E0BCCCFF23E013288DA"
1990 DATA "F021C1FD352ADBFD18A13
A8BF04721000022C3FD22C5A5"
2000 DATA "FD78FE03CA00F62175F07
EFE0D3E10CACFF2ED5BC3FD26"
2010 DATA "2BCD00F0ED53C3FDED53C
5FDED5BC7FDCD00F0A7C2CFEB"
2020 DATA "F2ED53C7FDED5BCBFDCD0
0F0A7C2CFF2ED53CBFD2AC7E6"
2030 DATA "FDED523E08D2CFF2ED5BC
7FDCDCCEDED53C7FDED43E5C0"
2040 DATA "FDC5ED5BCBFDCDCCEDED5
3CBFDED43E7FDE1A7ED423E69"
2050 DATA "0AD2CFF23A89F03D2029E
D5BCBFDD5C513CDCCEDE1A7A1"
2060 DATA "ED42DA42F6111027E1EBA
7ED522BED4BC3FDA7ED423E72"
2070 DATA "11DACFF2C3C8F02AC7FDE
D5BC3FDA7ED523E12DACFF2EE"
2080 DATA "CACFF2EBCDCCED2AC7FDA
7ED523E12C2CFF2CDACF63E50"
2090 DATA "013289F0C3C8F0E5D5F53
A8FF0A7201C2AB25CED5B4B3D"
2100 DATA "5CA7ED52E52AEFFD11000
119D1ED523F3E008F328FF035"
2110 DATA "F1D1E1C9210000ED5BC3F
DA7ED5222C3FDC9C53A8AF09F"
2120 DATA "473A085C328AF0FE0D201
578FE1FCAE2F63AB25CFE203E"
2130 DATA "20083A835CFE17CACBFAC
1F1FBC9AF3261FAC389EE4415"
2140 DATA "4156494457524947485443
3554D4252494131393834 01D3"
2150 DATA "F7FFF3F53A61FA3DCABAF
63A085CFEE6CAD5FE3A8AF0FD"
2160 DATA "FE233A085C328AF0C260F
7E6DFE52189F03603FE52CA1B"
2170 DATA "2DF335FE53CA2DF335FE4
1CA2DF33604FE44CA2DF33488"
2180 DATA "FE43CA2DF334FE4CCA2DF
3FE46CA89FBFE56CA26FEFE65"
2190 DATA "58CC33EDCA89EEE1F1FBC
93A8BF0472175F07EFE0D3E64"
2200 DATA "14CACFF22BCD00F0A7C2C
FF2ED53C7FDCD00F0A7C2CFAA"
2210 DATA "F2ED53CBFD3A89F0FE05C
A19F9110F27CDCCEDED53DF78"
2220 DATA "FDEBED5BC7FDA7ED523E1
7DACFF22ACBFDED5BC7FDA76F"
2230 DATA "ED523E15DACFF2CDCCED2
B22E9FDED53C7FDED53D9FD00"
2240 DATA "2ACBFDA7ED523E16DACFF
2ED5BCBFDD5CDCCEDE1A7EDA7"
2250 DATA "523004ED5BD9FDED53CBF
DC302F12145FF06113E0A3258"
2260 DATA "895C112020ED53BBFDED5
3BDFDCDBAEE21F559CBFECDA2"
2270 DATA "33EDAF32085C3A085CA72
8FACBBECD29EDE6DFFE59287C"
2280 DATA "0AFE4E20E2CD61EFC389E
ECD61EF2ADFFDED5BCBFDA789"
2290 DATA "ED52C242F82AE9FD224B5
CC389EEED5BCBFD13CDCCEDF7"
2300 DATA "2BEB2A4B5CA7ED52444D2
AE9FDEBEDB0ED534B5CC38929"
2310 DATA "EEC5D51198F006030E40C
DAEF8D1C1C9C5D511A4F0068B"
2320 DATA "020E60CDAEF8D1C1C9C5D
511B6F006010E80CDAEF8D168"
2330 DATA "C1C9F53A89F0FE033814F
E042810C5D5112FFF06000EA6"
2340 DATA "A0CDAEF8D1C1F1C9F13E0
6C9E5F5792121130E0009223E"
2350 DATA "885C26406F22845CEB462
37ECD61EF2310F9F1E1C92A9B"
2360 DATA "D5FD772322D5FD3E06904
73A8BF080328BF0CDBEEFCBA2"
2370 DATA "BE3A89F0FE0620083A8DF
0FE03CA62FA3A8DF03C328D2D"
2380 DATA "F0FE03CC70F8FE04CC7FF
8FE05CC8EF8FE06CADCF30662"
2390 DATA "05CDBEEFCBFEC39BF3CD0
0F0A7C2CFF2ED53DDFD3A8C60"
2400 DATA "F0A73E18CACFF2D5CDCCE
DCDCCED2B22E9FDED53F3FDBC"
2410 DATA "E1A7ED523E19CACFF2380
62A4B5C22E9FDED5BC7FD2AF6"
2420 DATA "CBFDA7ED523E15DACFF2C
DCCEDCDCCED2B22EBFDED531D"
2430 DATA "C7FDD5ED5BCBFDCDCCEDC
DCCEDED53CBFD234E234609A0"
2440 DATA "22EDFDC12ADDFDAF328EF
0ED42380E3C328EF009ED52D9"
2450 DATA "30053E1AC3CFF22ACBFDE
D5BC7FDED4BDDFDA7ED520910"
2460 DATA "22F1FD111027ED523E1BD
2CFF2110F27CDCCED2ADDFD54"
2470 DATA "AF32C2FDED5230133C32C
2FD2AF1FDED5BF3FDA7ED5285"
2480 DATA "3E1CD2CFF2C302F12A4B5
CED5BE9FDD5D5E5A7ED52445B" ,
2490 DATA "4D2AEDFDED5BEBFDED522
322EFFDCD83F63A8FF03D3E7B"
2500 DATA "1DCACFF2D1D519224B5C2
B545DE12B3AC2FDA72802EDCF"
2510 DATA "B8ED4BEFFD2AEBFD3A8EF
0A7200109D1EDB02ADDFDEDD6"
2520 DATA "4BC7FDA7ED42444DE1562
35ED5EB09EB2B722373235E96"
2530 DATA "23562319D1E52ACBFDA7E
D52E120E4C389EE4457524998"
2540 DATA "474854313938 3400CD29E
D3E013261FA210A0022C7FD79"
2550 DATA "7D32C1FD3A8BF047FE022
8202175F0487E05FE0D28073C"
2560 DATA "CDD8EFA7C2CFF2ED5BC7F
DCD00F0A7C2CFF2ED53C7FDB5"
2570 DATA "2A4B5CED5B535CA7ED522
AC7FD2817EBD5CDCCEDED5361"
2580 DATA "CBFDE1A7ED523E01CACFF
22AC7FD3816111027ED53CBE8"
2590 DATA "FD180D2AC7FD3AC1FD160
05F1922C7FDE5EBCDA2EDE189"
2600 DATA "ED5BCBFDA7ED523E02D2C
FF22AB25C2BF92B2B223D5C36"
2610 DATA "CD6E0DFDCB019EFDCB029
EFDCB02EECDB0163E00CD016E"
2620 DATA "1621B412E52A3D5CE5217
F10E5ED733D5C060421BBFDFB"
2630 DATA "FDCB01EE7E32085CE5C5C
DE615CD4C0FC1E12310EBE50A"
2640 DATA "21005C36FF3E1F328AF03
2085CE1FDCB01AEFBC3380FAE"
2650 DATA "78FE11C821D5FD3504C5C
DAF0DCDB0162132FC0604CD82"
2660 DATA "71EFCD87FD21211622885
C21404022845CC1483E11909A"
2670 DATA "2808472175F0CD71EF41C
D13FDCBFEAFC92175F022D506"
2680 DATA "FD0611CD55FBCD33EDAF3
2085C3A085CA7CA9BFBFE0D13"
2690 DATA "CAD8FBFE0CCC4CFBFE0FC
C57FDFE01CC57FDFE2038DD39"
2700 DATA "2AD5FD772322D5FDCD13F
DCBBECD61EFCD13FDCBFE10C3"
2710 DATA "C63E13CDCFF23E0D2AD5F
D77CD13FDCBBE3E0132885C1E"
2720 DATA "CD29EDFD3607003E4C323
BFCCD87FD78FE11CA89EE214A"
2730 DATA "75F00610CD95FC772310F
92A535CED5B4B5CA7ED52D2FC"
2740 DATA "89EE1922AFFD232323231
10000ED533CFCCD42FC2AAF57"
2750 DATA "FD23235E2356231918D84
6494E444D4F4445204C310029"
2760 DATA "0F0019001175F01A47CD9
5FCCDB61828F8FE0DC8FE2009"
2770 DATA "3806CDFFFCB828032318E
822B1FDED4B3CFCED433EFCB6"
2780 DATA "CDFFFC13231AFE0D282B4
7CD95FCB828EFFE0D280ACDF4"
2790 DATA "B61828F1FE20233BEC2A3
EFC223CFC2AB1FD2318AD7E48"
2800 DATA "FE61D8FE7BD0CBAFC9ED4
B3CFCED4340FC110000ED53F0"
2810 DATA "3CFCCDD3EEE5CDA2ED21B
BFD0604CD71EFE12323237EDF"
2820 DATA "CDB618FE0D2831FE20382
6CDFFFCE52A3CFCED4B3EFCFC"
2830 DATA "A7ED42380D09ED4B40FCE
D423004FDCB55FEE1FDCB01C0"
2840 DATA "AE7ECD61EFFDCB55BE231
8C7CD29ED188AE52A3CFC2315"
2850 DATA "223CFCE1C9F53EFDED47F
1ED5EFBC9F52A885C7D3D2045"
2860 DATA "0F252E2122885CC544CD9
B0E22845CC1CDBEEFF1C9D2D1"
2870 DATA "454E554D424552C14444D
3554254524143 54C34F5059FA"
2880 DATA "C4454C455445CC494E455
3204155544F80FD4E070D3EA4"
2890 DATA "4CFA6CFD20040E033E470
DFD710718183E48FDCB015ECB"
2900 DATA "2806FDCB019E180A3E45F
DCB01DEFD360701323BFC2AAF"
2910 DATA "885CE52A845CE5210D182
2885C21144022845C2136FCCE"
2920 DATA "C50606CD71EFC1E122845
CE122885CAFC9D78C0000C125"
2930 DATA "5D024F4C44CA3A3030323
03A010A0164006400 0A00001C"
2940 DATA "00640001000A00E900E80
07CF009000A0063000A002652"
2950 DATA "0CE90001000F0012004F5
E235E4E5E0000140032000138"
2960 DATA "004457524947485400 01F
EFFF3F53E0D32085CF1FBC995"
2970 DATA "212FFD47CD61EF78C6804
77E23B820FB7ECB7FC0CD61E0"
2980 DATA "EF2318F6CDAF0D2101162
2885C3E502A535CCDA2FE3EF9"
2990 DATA "562A4B5CCDA2FE3E452A5
95CCDA2FE3E522AB25CCDA29A"
3000 DATA "FECDCCFE3E50210AFFCD0
FFE3E4C2A4B5CED5B535CA720"
3010 DATA "ED52CDA2FE3E56210AFFC
D0FFE3E4C2A595CED5B4B5C9C"
3020 DATA "A7ED522BCDA2FE06063E2
0CD61EF10F93E462AB25CEDB7"
3030 DATA "5B595CA7ED522BCDA2FE2
1BAFD363AC392EEE5210AFF28"
3040 DATA "CD0FFEE1DD21BAFDDD360
02F011027CD3FEECDA7ED064B"
3050 DATA "023E20CD61EF10F921BAF
D0605CD71EF21895C352B3E3A"
3060 DATA "0177C9CDAF0D3EE6CD61E
F3E44CD0CFEAF32085C2A4B1E"
3070 DATA "5CED5B535CED52CA89EEF
DCB01DE3E043289F021010089"
3080 DATA "22C7FD210F2722CBFDC39
1F7D0524F472020D641525326"
3090 DATA "2020C54C494E4520D2414
D544F50CC454E47544BC652FA"
3100 DATA "4545202080154E4557205
6414C554520464F522046499C"
3110 DATA "525354CA3D434F4E46495
24D202028592O6F72204E2967"
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QL

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QL Cash Trader

SOME TIME ago I was impressed by an early copy of a program for the QL called **Cash Trader** from Accounting Software. Quest PLC, too, was sufficiently impressed to buy Accounting Software Ltd, and to defer work on **Tally**, its own program. **QL Cash Trader** is now available from Sinclair Research for £69.95.

Cash Trader has been designed to help keep the books and produce financial reports, such as profit and loss accounts, for businesses that pay and get paid, for goods and services as they are supplied.

The first thing that will strike most Sinclair users is the sheer size of the manual which consists of over 200 A5 pages, the majority of which is made up of examples and sample layouts. The manual has been well thought out but suffers from trying too hard to explain all eventualities. That detracts from the examples illustrated and would have been better consigned to a separate section of the manual.

Each time I tried to make the working — back-up — copies of the three cartridges which hold the program, the QL crashed with a 'format failed' message. No warm restart is available so the QL must be reset and the program rerun from the start. Finally, after two hours I had working copies. Then I had to work through a series of examples before I could use **Cash Trader**. This is a good idea and gives a useful introduction. However, I found it difficult at first to relate money received shown as a debit against a bank account.

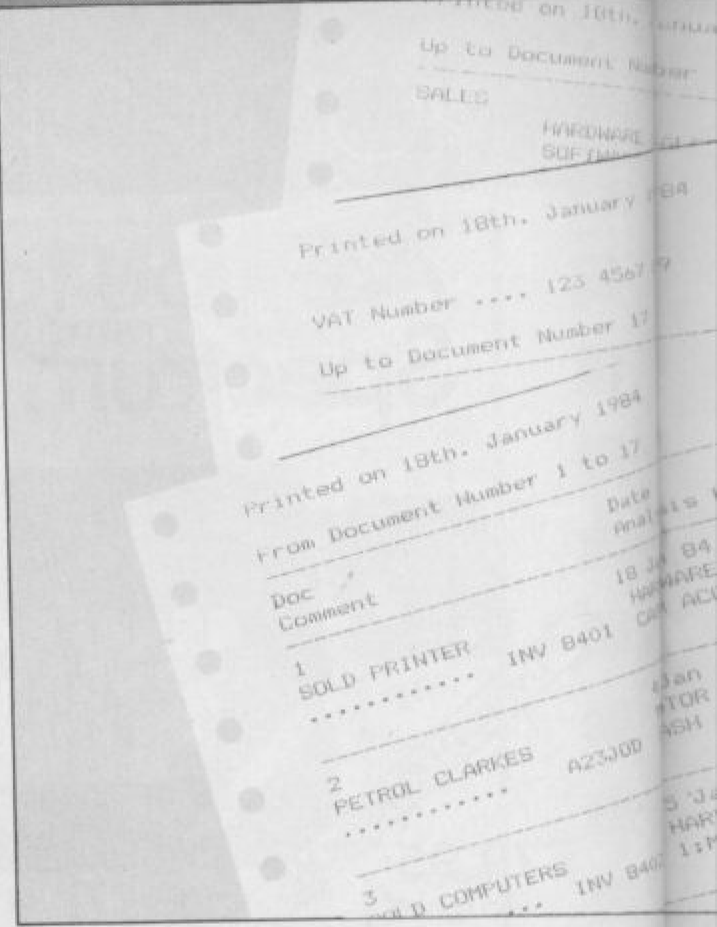
The basis of **Cash Trader** is the group. Each group links together up to 10 different analysis heads. Those can be thought of as account names. Of the 14 permissable groups, four have fixed names and the others can all be assigned by the user.

The groups are linked to six categories whch are used to produce the profit and loss account and balance sheet. Five VAT rates have been built in and one of those is irretrievably linked to an analysis head when it is set up. The names and rates can be changed to suit any changes in legislation.

Three main windows make up the main display. Those are the report window, which is used to display the profit and loss account, balance sheet and other reports, the entry window, which is used to show the details of the current entry, and the help window used to display options and other useful information.

Entering data is easy as prompts are given in every case, and mostly it is a case of using the left and right arrow keys to roll from one option to another. The left-hand side of the window is used to show where money is coming into and going from the business. It consists of the document number, the date, whether the entry is a payment, receipt or adjustment and which of the four pre-selected groups it is assigned to, together with any reference.

The right-hand side allows items to be double-entered against the left-hand side. It consists of a group name,



analysis head, amount, VAT rate and a comment. Once that data has been entered the user is given an opportunity to enter the VAT himself or to let the program calculate the amount.

The ESC key is used to skip back to the last detail entered and F1 is used to delete individual characters from entries such as the comment or reference. When the correct details have been input there is a final chance to change your mind before the document is accepted.

Once the data is entered the report cartridge is used to give printouts of the various reports of documents' details: VAT report, profit and loss, balance sheet and trial balance. Calculating the VAT return is also offered as an option of the security routine which also allows the copying of data

Superfile

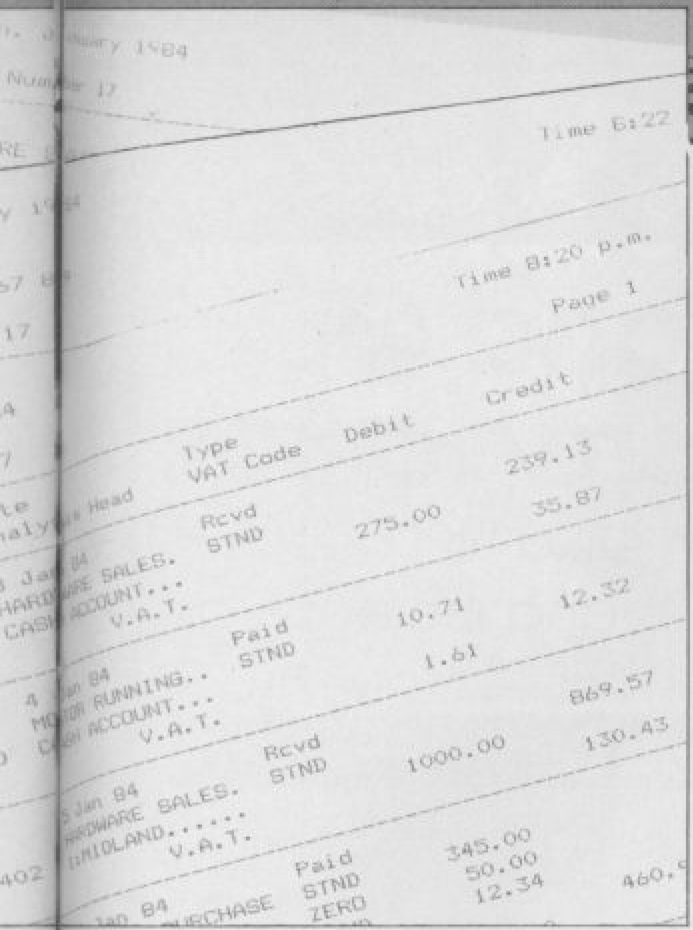
IF YOU are thinking of buying a database then you will probably be thinking about **Masterfile** from Campbell Systems. This is, arguably, the most powerful database available for the Spectrum. However, if you do not need all the features of a full database, a simple card index type, which is generally easier to use but less flexible may be a better buy. **Superfile** from Transform Ltd is just such a database. It costs £14.95 and will also double as a word processor. Although the program is supplied on tape it can be customised for any printer and saved to microdrive.

Superfile works exactly like a card index. Each page is treated as a card of 63 columns and 22 lines. On the top line is a page number and space for a title. The remainder is free for notes. The cursor keys are used to move about the page and text is typed straight in at the cursor. If text is already there then it is overwritten.

Because the database is a series of 'cards' used to store information it can also be used as a word processor. As such it is competent without the extra features that are now expected. The features include wordwrap and left and right justification. Spaces and lines can be inserted and can then be overwritten to add new text into the existing text. 'Cards' and lines as well as characters can be deleted. Although no search facility exists in the word processor as such, the full search facility of **Superfile** can be used to locate the card on which the string exists. Eyesight must then be used to find the string on the card.

Unlike most databases there are no variables or fields and the appearance of the card can be changed for each one. The cards are stored in the 30K of memory left free by the program until they are saved to tape or microdrive. They can be displayed later by specifying a string of characters, the title or the page number.

Searching for a string also has the effect of creating a separate list of cards which include the string. Such cards are known as being 'selected'. The selected and unselected lists of cards can be changed over or inverted and also reset so that all cards are selected. With no indication in the



cartridges and the clearing of the group and analysis head names.

Like all programs, **Cash Trader** is not perfect. At times it seems incredibly slow and having to switch between the different cartridges is a nuisance. Despite those early doubts, the limit of 10 analysis heads to a group seems adequate to cover most cases. **Cash Trader** is exceptional value for an excellent program.

Support is being given through a Trader support club, which costs £25.00 and which produces newsletters and pamphlets giving details of particular problems and enhancements.

Mike Wright

Publisher Sinclair Research
Price £69.95
★★★★★

manual I found it confusing at first that after a search the selected cards are not displayed on screen. If you want to see what they are you will print them out or use the update option to get them displayed.

Although I like **Superfile** I wonder about its use in a practical environment. Once the program and data file have been loaded it is probably as quick, if not quicker, to look up any single card with it as it would by using actual cards. However, if the program needs to be loaded each time then it will certainly be quicker and cheaper using cards.

Mike Wright

Publisher Transform Ltd, 24 West Oak, Beckenham, Kent **Price** £14.95
★★★

The Unitrust Program

SOME TIME ago I reviewed **Va£track 2**, a program that kept track of a portfolio of stocks and shares. This month a more specialised area of investment, unit trusts, is the subject of a review. **The Unitrust Program** costs £12.00 from Michael Slatford Software and is designed to monitor a unit trust portfolio by giving information on the current value of the portfolio and its individual trusts using a 48K Spectrum.

The program is supplied on cassette with a manual consisting of four single sided A4 sheets. You are expected to know the language and terms of unit trusts but apart from that, the manual adequately describes the function of each of the main menu options.

Data on up to 50 unit trusts can be kept. Unfortunately the number you intend to keep data on must be specified on the first run through the program. After that the only way to keep information on more trusts is to keep a separate copy or run the program again and re-enter all the data.

The program is run from the main menu and is based on the concept of a database of cards containing the name of the company and unit trust, the amount invested with the price when bought and the quantity. Also shown on the card is the value of the holding at the latest bid price entered and the date of that price, together with other information on how the trust has performed over the period.

The main menu has seven options which allow data to be entered for new investments, updates to be made to the portfolio, analyses and printouts of the information to be obtained and the program to be saved. Each option has a subsidiary menu with a more detailed choice.

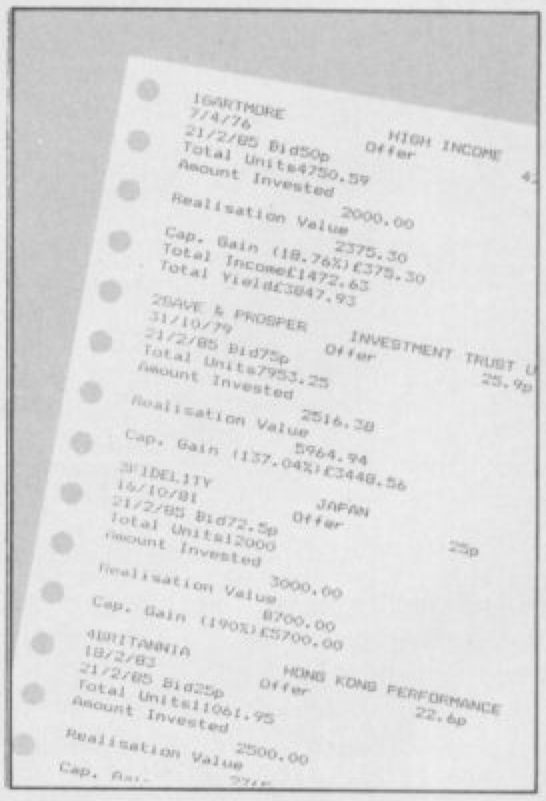
Despite being a first offering from Michael Slatford the error trapping is of a high quality, even to accepting 29 February only in leap years. Although, at times, it seems to take an age before spotting an unacceptable entry. The screen displays, in general, are clear and readable although the card display does become cluttered when large amounts are used. In every case the clarity of the display is lost when it is printed. Unlike most business programs these days the data is not stored as a separate file but is stored as variables within the program. Saving a new copy of the program each time the data is updated could be a problem. However this seems to have been anticipated by allowing different versions to be saved with different names.

The **Unitrust program** will not tell you when to buy or sell your units, nor will it help you sort out your Capital Gains Tax. Problems of this sort are for you and your accountant. What the program will do is give information on the state of your portfolio and individual trusts within it. For someone who is relatively new to this form of saving, perhaps there is too much information when all they may be interested in is how much the original investment is worth.

Since this article was written an improved and extended version has been released. The program is now called **The Investment Monitor** and now covers the whole range of investments including shares, gilts and investment bonds. New features include the ability to renumber the cards to suit yourself and high and low values of the investment. For current users of the program wanting to update, this can be done by returning the original version and including a £5.00 fee. Unfortunately you will also have to retype all your data into the new version.

Mike Wright

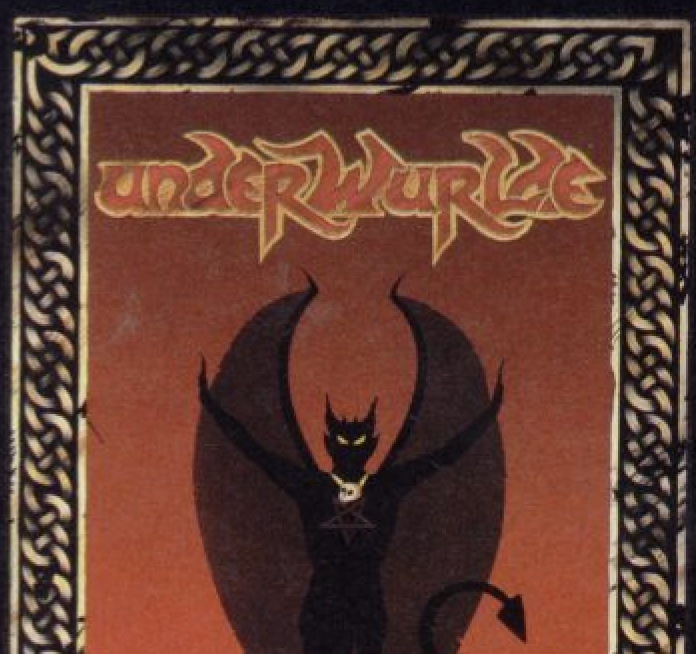
Publisher Michael Slatford, 3 Campden Road, South Croydon, Surrey CR2 7EQ **Price** £12.00
★★★

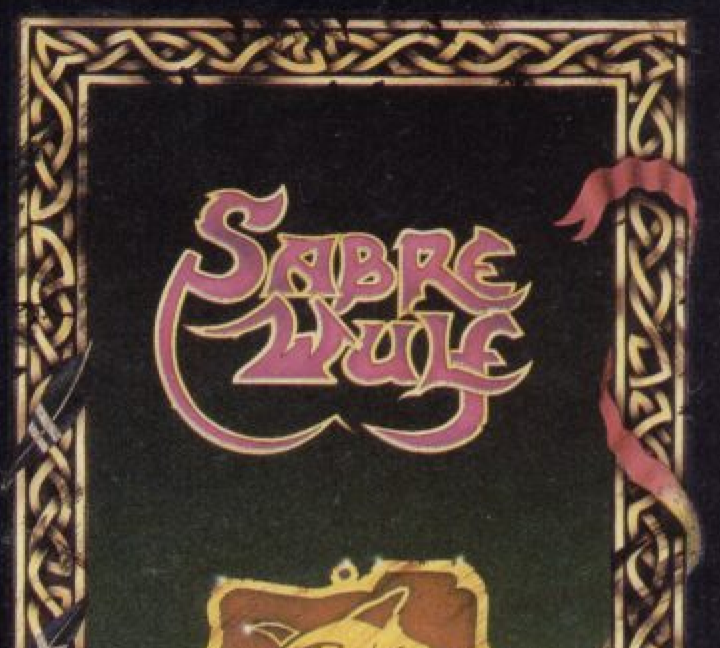


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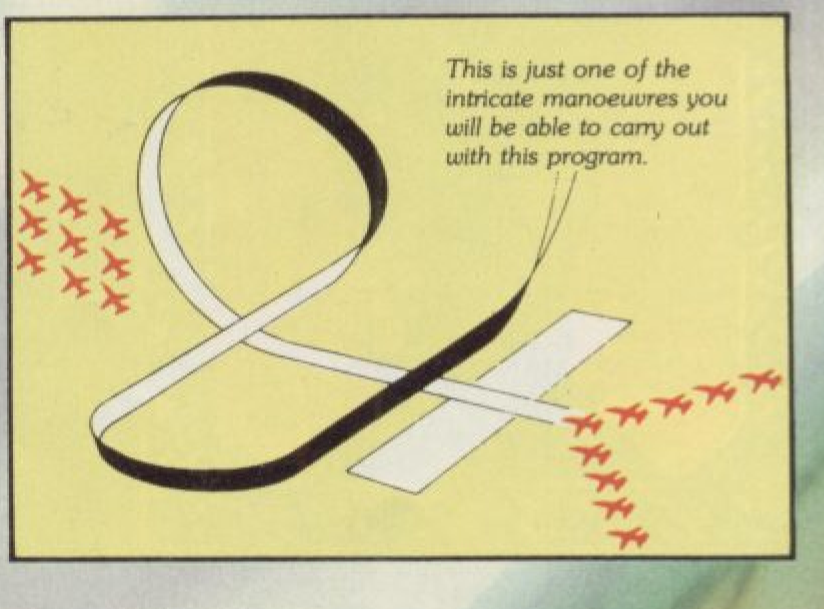
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GRAPHICS INSTRUCTIONS

IN GENERAL, graphics abbreviations are enclosed in brackets, which should not be entered. A string of the same graphics character is represented in the form (3*A) which would be entered as AAA, where A is the graphics character. A space, where it is important to have the correct number of spaces, is indicated by (sp). Spaces in text will not normally be indicated. Where several graphics characters are used, they are separated by commas, which should not be entered. With Spectrum and QL listings the letter I has a flat top and the numeral 1 has a sloping top.

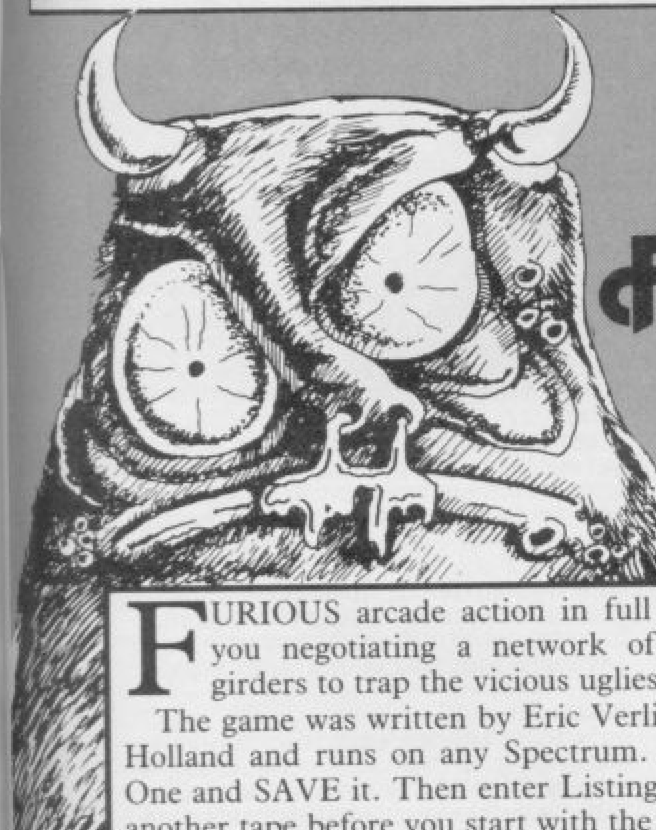
The above applies to all Sinclair machines. The following instructions are for specific machines.

ZX-81: ZX-81 listings are generally reproduced as they appear when you enter them, spaces and all. Where extensive graphics are used, REM statements will be inserted to provide a guide to the position of each character.

Spectrum: User-defined graphics are represented by underlined letters, without brackets. Type the appropriate letter while in graphics mode. The underline does not appear on the screen. Inverse characters have the letter i before them, e.g. iZ, iA, iP. Block graphic characters are indicated by g followed by the number of the appropriate key: g4 would mean the block graphics on key 4, ig4 the inverse of that graphic.

Control codes are indicated by cc before the character, and are obtained by pressing CAPS SHIFT while in extended mode. They do not appear on the screen but may change the colour of the cursor and will affect what is printed after them: cc3,i* would thus have the effect of printing an inverse asterisk in red.

QL: User-defined graphics on the QL are indicated by a description of the keys pressed to obtain them, underlined and in brackets. Thus (CTRL + 9) means press CTRL and 9 together. The same applies for unusual characters within the QL character set, which our printer is unable to reproduce.



STEEL FRENZY

FURIOUS arcade action in full machine-code sees you negotiating a network of ladders and steel girders to trap the vicious uglies.

The game was written by Eric Verlind of Apeldoorn in Holland and runs on any Spectrum. First enter Listing One and SAVE it. Then enter Listing Two and SAVE to another tape before you start with the code. RUN Listing Two. You will be given a menu. Choose the Input option. When you have had enough, finish the block, type QUIT and save to tape. Then you can load what you saved later and start again but with the latest block as your start block.

Use cursor keys to move and 0 to dig a hole, 9 fills in a hole and H halts the game, SPACE continues it. The game is also Kempston compatible.

Listing One

```
 60 REM
 70 INK 0: PAPER 6: BRIGHT 1: B
ORDER 5: CLEAR 27519: GO SUB 260
 80 PRINT#0;CHR$ 127;" 1985 Ve
rlind Software Unltd..."
 90 INK 6: PRINT AT 7,0;
100 LOAD ""CODE 27520
110 RANDOMIZE USR 27776
120 STOP
130 GO TO 130
140 PLOT x,y: DRAW 15,0: DRAW 0
,-31: PLOT x,y: DRAW 0,-31: PLOT
 x,y-16: DRAW 15,0: RETURN : REM
 A
150 PLOT x+15,y: DRAW -15,0: DR
AW 0,-31: DRAW 15,0: RETURN : RE
M C
160 PLOT X,Y: DRAW 11,0: DRAW 4
,-15: DRAW -4,-16: DRAW -11,0: D
RAW 0,31: RETURN : REM D
170 PLOT X+16,Y-7: DRAW 0,7: DR
AW -15,0: DRAW 0,-31: DRAW 15,0:
 DRAW 0,15: DRAW -8,0: RETURN :
REM G
180 PLOT X,Y: DRAW 0,-31: PLOT
X,Y-16: DRAW 15,0: PLOT X+16,Y:
DRAW 0,-31: RETURN : REM H
190 PLOT X,Y: DRAW 15,0: PLOT X
+8,Y: DRAW 0,-31: PLOT X,Y-31: D
RAW 15,0: RETURN : REM I
200 PLOT X,Y: DRAW 0,-31: DRAW
15,0: RETURN : REM L
210 PLOT X,Y-31: DRAW 0,31: DRA
W 15,0: DRAW 0,-31: PLOT X+8,Y:
DRAW 0,-31: RETURN : REM M
220 PLOT X,Y-31: DRAW 0,31: DRA
W 15,-31: DRAW 0,31: RETURN : RE
M N
230 PLOT X,Y: DRAW 15,0: DRAW 0
,-31: DRAW -15,0: DRAW 0,31: RET
URN : REM O
240 PLOT X+15,Y: DRAW -15,0: DR
AW 0,-16: DRAW 15,0: DRAW 0,-15:
 DRAW -15,0: RETURN : REM S
250 PLOT X,Y: DRAW 15,0: PLOT X
+8,Y: DRAW 0,-31: RETURN : REM T
260 INK 1
270 LET Y=154
280 LET X=24: GO SUB 150
290 LET X=48: GO SUB 140
300 LET X=72: GO SUB 250
310 LET X=96: GO SUB 150
320 LET X=128: GO SUB 180
330 LET X=160: GO SUB 210
340 LET X=192: GO SUB 140
350 LET X=224: GO SUB 220
360 INK 0
370 LET X0=108: LET Y=98
380 LET X=X0: GO SUB 190
390 LET X=X0+24: GO SUB 240
400 INK 2
410 LET X0=36: LET Y=42
420 LET X=X0: GO SUB 200
430 LET X=X0+24: GO SUB 230
440 LET X=X0+48: GO SUB 140
450 LET X=X0+72: GO SUB 160
460 LET X=X0+96: GO SUB 190
470 LET X=X0+128: GO SUB 220
480 LET X=X0+160: GO SUB 170
490 RETURN
```

Listing Two

```
 10 GO TO 550
 20 INK 7: PAPER 1: BORDER 3: C
LS : SAVE "CATCHCODE"CODE 27520,
4480
 30 PRINT ">> VERIFY (Y/N)?"
 40 IF INKEY$="N" THEN  RETURN
 50 IF INKEY$<>"Y" THEN  GO TO
40
 60 PRINT : PRINT  FLASH 1;"PLA
Y YOUR TAPE"
 70 VERIFY "CATCHCODE"CODE 2752
0,4480: PRINT : PRINT "O.K.": PA
USE 25: RETURN
 80 INK 4: PAPER 0: BORDER 1: C
LS
 90 PRINT : PRINT  FLASH 1;"PLA
Y YOUR TAPE"
100 LOAD "CATCHCODE"CODE 27520,
4480
110 PRINT : PRINT "LOADED WELL.
": PAUSE 25: RETURN
120 INK 0: PAPER 7: BORDER 4: C
LS
130 LET A=10: LET B=11: LET C=1
2: LET D=13: LET E=14: LET F=15
140 PRINT "Enter number of the
FIRST block to enter ";: INPUT b
eg: PRINT beg: IF beg<>INT beg O
R beg<0 OR beg>69 THEN  GO TO 14
0
150 PRINT : PRINT "Enter number
 of the LAST block  to enter ";:
 INPUT end: PRINT end: IF end<>I
NT end OR end<beg OR end>69 THEN
  GO TO 150
160 PRINT : PRINT "You want to
enter block ";beg: IF beg<>end T
HEN  PRINT "to ";end
170 PAUSE 50: CLS
180 RESTORE : FOR N=1 TO BEG: R
EAD SUM: NEXT N
190 FOR N=BEG TO END: READ SUM
200 PRINT "TYPE IN: BLOCK ";N:
PRINT
210 INPUT  LINE B$
220 PRINT B$
230 IF B$="QUIT" THEN  RETURN
240 IF LEN B$=128 THEN  GO TO 2
60
250 PRINT : PRINT  FLASH 1;"INC
ORRECT ENTRY, TRY AGAIN!": PRINT
 : GO TO 200
260 FOR G=1 TO 128: LET K=CODE
B$(G): IF ((K>=CODE "0") AND (K<
=CODE "9")) OR ((K>=CODE "A") AN
D (K<=CODE "F")) THEN  NEXT G: G
O TO 280
```

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```
 270 GO TO 250
 280 LET TOT=0
 290 FOR G=0 TO 63
 300 LET V=16*VAL B$(2*G+1)+VAL
B$(2*G+2): POKE 27520+N*64+(63-G),V
 310 LET TOT=TOT+V
 320 NEXT G
 340 IF TOT<>SUM THEN  PRINT : P
RINT  FLASH 1;"* CHECKSUM ERROR,
 TRY AGAIN...": PRINT : GO TO 20
0
 350 PRINT "ENTRY O.K.": PRINT "
--------------------------------
": PRINT
 360 NEXT N
 370 RETURN
 380 INK 0: PAPER 6: BORDER 2: C
LS
 390 PRINT AT 3,11;"* MENU *"
 400 PRINT AT 8,3;"1   -   INPUT
 ROUTINE.";AT 10,3;"2   -   SAVE
 MCODE.";AT 12,3;"3   -   LOAD M
CODE."
 410 PRINT AT 20,6; FLASH 1; BRI
GHT 1; INK 4; PAPER 7;"* MAKE YO
UR CHOICE *"
 420 LET K=CODE INKEY$-49
 430 IF INT (K/3) THEN  GO TO 42
0
 440 IF NOT K THEN  GO SUB 120:
GO TO 380
 450 IF K=1 THEN  GO SUB 20: GO
TO 380
 460 IF K=2 THEN  GO SUB 80: GO
TO 380
 470 REM * CHECK DATALINES *
 480 LET t=0
 490 RESTORE
 500 FOR n=0 TO 69
 510 READ d: LET t=t+d
 520 NEXT n
 530 IF t=418025 THEN  RETURN
 540 BEEP .5,12: BEEP .5,-12: BE
EP 1,-36: PRINT  FLASH 1; BRIGHT
 1; INK 4; PAPER 0;"* ERROR IN D
ATAS. (WHAT A PITY)."
 550 CLEAR 27519: POKE 23658,8:
GO SUB 470: GO TO 380
 560 DATA 3840,6378,4116,1721,65
77,6234,7173,5426,6197,7082
 570 DATA 6835,6436,7537,6922,71
62,7776,6907,5499,8419,6800
 580 DATA 7359,8685,6670,6675,77
24,6968,7150,7498,7366,7721
 590 DATA 6764,6414,7374,7406,59
30,5500,6050,7298,7176,6712
 600 DATA 7075,5820,6992,5464,63
04,6874,6034,7896,5933,5954
 610 DATA 7920,6605,6560,5906,55
76,6853,6595,6957,6274,6328
 620 DATA 6467,562,0,849,2001,13
02,4093,3930,3085,339
```

Blocks

```
--------------------------------
BLOCK 0
66A12212141D1E183C141414141C1414
66A12212141CDC2C14141C183C7E2E3C
6685444828B8781B3C28282828382828
668544482838383B342828381B3C7E743C
--------------------------------
BLOCK 1
662424247E7E7E7E7EFF99BDBDA5BD81
7E3D3D193C7E7E3C7EBCBC983C7E7E3C
202020242424BCBCBC7E3D3D193C7E5A3C
04040424243D3D3D7EBCBC983C7E5A3C
--------------------------------
BLOCK 2
000000000000000018181818187E7E1818
42667E6A7E3C4281818181810000000
818181FF818181FF00000000000DD0000
000000000000DD7700000000000000DD77EE
--------------------------------
BLOCK 3
00000000000000000000000000000000
00000000000000000000000000000000
0000000000000000F0F0F0FF0F0F0F0
14141C1C7F495D5D081C1C1C08142241
--------------------------------
BLOCK 4
C532043E7AC4327AC632AF0136F0204F
CB0618003604204 7CBFEDBF73E7AEB21
203CCD004F017BF011325536FD7A8ECD
320EFB1601CD023E229BCD043E7A72CD
--------------------------------
BLOCK 5
3A229BCD013E1F36231F367AD1210236
2310367AC9217ADB323C012809FE7ADB
3A7AC632AF0F2004FE7AC6323C7AC63A
1A28B77AC43A5CB073ED7ADB32013E7A
--------------------------------
BLOCK 6
2A2A2A2045524F43533E780BCD7ACC32
7ACD32AF764FCD7A8ECD040EB0ED02FF
017CDF111F367CDE217A72CDB0ED006D
017AEC117B83217ADA32AF7AD9327ADB
--------------------------------
BLOCK 7
FE3C7ACC3A7793CD102E7ACC32AF7ACD
32033E5B16FC102C711E06160E580121
7A48CD7B62217A21CDFF3C2A2A2A2A2A
2A2045524F4353484749482020 2A2A2A
--------------------------------
BLOCK 8
FE7C47090040016 0C6EB20BD23E10805
3609E5E110360720BE1F3E0819E55800
017CDE11006021803EDB187ACD326DC7
CA18FE03C67ACD3AEE187ACC32052820
--------------------------------
BLOCK 9
197CFE211436197CDE217828CDF310C1
7793CDC5132E347ACD21E546E17793CD
142EE5237AC9327ACC327E237ACA327A
CD327EC509067B1E21D818786E15CA03
--------------------------------
BLOCK 10
CB0136022B47CB1FDBAF1E2001FE7AEB
3A00362B00367AC8216FA7C37AD332FF
3E7AC932103E7ACA32143E6D97C3BA10
23C1E1FB1019133600 2011EBE546E1EB
--------------------------------
BLOCK 11
FB1803D6043803FE7ACA3A0136022067
CBFF3602205FCB230136022057CBFEDB
EF3EFF36022067CBFEDBF73E21180136
252857CBFF3602285FCB23FF3602284F
--------------------------------
BLOCK 12
3A7AD1327E197CBE2118281FFE7E197C
FE217828CD7611CA7B32CD7AC9327789
CD77D1CD70CFC2B8023E7014CABE2B01
4736FD6F2CC2BEAF47004736FD7ACB32
--------------------------------
BLOCK 13
211F36197CDE21D17793CD0E2E357ACD
217ACC227AC92A06361958002 11F3619
7CDE21EB19FFE021D57828CD7AD63203
3E6FA7C37AD3324F7AC73A7AD2327AD0
--------------------------------
BLOCK 14
FE797014DA02FE7014D215FE817ACA3A
4F7AC83A6EABC3A8203D7AD63A347ACA
217793CD1F2E357ACD217793CD1F2E77
68CD7793CD0F2E347ACD2106361958 00
--------------------------------
BLOCK 15
7611CA7832CD7786237AC83A77867ACA
217AC83A77D1CD70CFD215FE70CFDA13
FE7611CA15FE7E197CFE217828CD1718
7014CA1FFE7014CA14FE7AD23A0F2801
--------------------------------
BLOCK 16
1886860 83E0628FFFE7AC83A7796013E
7AD5211E204647CBFD7AD1327E197CBE
217828CD7AD2327AD13A11187AD2327A
D03A7AD1327AD23A0E20BE013E7AC821
--------------------------------
BLOCK 17
36195800210636195 7E02177197CDE21
08770B197CBE217828CD3CB0013E0220
03FE7AD43203E63C7AD43A084744ED02
D6877AD33A1B1809C6877E08860C3E03
--------------------------------
BLOCK 18
84CD70CFF213FE7ACA3A707FC247CBFE
DBEF3E0918707FCA67CB1FDBAF0A2001
FE7AEB3A70CFC202FE7ACB3A7793CD6F
08357ACD217793CD6F7ACC227AC92A06
--------------------------------
BLOCK 19
3E7793CD6FF17ACD323C7ACA3A7ACC32
7784CDF5053619582021773C01181F3E
042012FE0A281FFE7E197CFE2170CFC2
BE1F3E197CDE21784ACD6F5E7ACA2177
--------------------------------
BLOCK 20
7784CDF5053652EDA77CDE1119580011
773D0E2810FE0518123E04201FFE7E19
7CFE2170CFC2BE1F3E197CDE21784ACD
6F5E7ACA217784CD70CFC24FCBFEDBEF
--------------------------------
BLOCK 21
1EBEDD7ACA3A72E2C200BEDDAF7AD753
ED7AEC21DD000011776 8CDF82047CBFE
DB7F3E082067CBFEDBBF3E764AD21F54
CD7793CD6FF17ACD323C7ACA3A7ACC32
--------------------------------
BLOCK 22
30BE7AC93A7ADC211B2000FE7AE13A22
2002FE7AE032FB1803D6043803FE7ADF
327ADD321E7EDD7ADE327ADC32287EDD
7AE132FF3E0218AF032007180 13E0430
--------------------------------
BLOCK 23
DD717ADF210B3015FE0F3813FE7E197C
DE21784ACD6E7ADC215F4F967ADD3A7A
E1212D3015FE313813FE0A7EDD71B0C3
7ADE3286013E0218AF0320071 8FF3E04
--------------------------------
BLOCK 24
4ACD6E2B5E7ADF217ADE321FE67ADE3A
7ADE321486DD7ADC3A1477DDFF3E0220
7CCB013E7865CD0E2014BEDDAF72E2C2
02FE7AE03A7611DA10FE71D8C3001436
--------------------------------
BLOCK 25
770A7EDD197CDE21043619580021784A
CD6E2B5E7ADD217ACE327E197CDE2178
4ACD6E2B5E7ADF2172E2C31477DD44ED
147EDD1C2015FE7ACE327E197CDE2178
--------------------------------
BLOCK 26
7CDE2143361958002 1784ACD6E2B5E7A
DF217611C3033010FE7ACE3A2877DD7A
DE3A1E77DD7ADF3A7793CD7ACC327ADC
3A7ACD327ADD3A6F080A77DD7ACE3A08
--------------------------------
BLOCK 27
7ACC327ADE3A7ACD327ADF3AFA36E519
5820211636E5197CFE211F36197CDE21
72E2C21FFE7E197CFE21D17793CD152E
7ACC327ADE3A7ACD327ADF3A1536D519
--------------------------------
BLOCK 28
E17A9BCDF410C17736CD013E7A9BCDC5
FB05067A21CDFB10787CCD0050110B28
B846AF7AD921787CCD025011 7793CD16
2E7AE4227ACC2A347ACD217793CD1F2E
--------------------------------
BLOCK 29
7AC63A7587D402FE7AC63A7768CD70EF
C323DD1C0628BB7AD93A7AD75BED7ADA
323C7530CABE7AD9217ADA3A01003 6DD
7793CD102E7ACC227AE42A1036E10536
--------------------------------
BLOCK 30
023015CB01C6787865CD7AEB327E2347
7AE6327E234F7AE7327E7AE222197B1E
1119196F6200165FF63009FEA40F3E78
65CD6E27D2BC903E7865CD6E27CA01E6
--------------------------------
BLOCK 31
7AE921584F3C03D6022014FE817AE83A
4702D603C6022002FE797305C20AFE05
2808FE092804FE0D2800FE11300CFE7E
197CDE21784ACD68597AE9321FE602D6
```





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BLOCK 32
2A087ACF327E197CDE21784ACD6F7AE9
3A5C7AE4226F847AE83A677AE73ADA18
4703C60530B9787305D213FE7305DA10
FE0A281FFE7E197CDE21C1784ACDC56E
--------------------------------
BLOCK 33
7AE50174E0C37AD2327ACE3A74E0C37A
D1327ACE3A092004FE042800FE483010
FE1E2815FE08692815FE5D3810FE7ACE
327E197CDE21784ACD6F7AE63A5C7AE4
--------------------------------
BLOCK 34
C9327AE93A7611CA15FE7ACF3A69187A
CF327ACE3AD8181374187 77ACE3A197A
F6210A20BE7AE93A197B1421142 0BE0A
197B0A211C28BE013E197AEC21000011
--------------------------------
BLOCK 35
777AE93A197B14210F2815FE7ACF3AE0
181303180220BE7AE63A197B14210C20
BE0A197B0A211428BE013E197AEC2100
00117AE5017611DA10FE7ACF3AE8187A
--------------------------------
BLOCK 36
4ACD6E7AE9215C7AE42A063E0218433E
042015FE0A18043E042014FE042813FE
F57ACF3A73FDC3347ADA217ACE327E19
7AF6210136197AEC2115187ACF32153E
--------------------------------
BLOCK 37
7ACD325FF17ACE32103E052000FEF818
03D6043803FEF57C7AE42A7ACE321F3E
7793CD6F7ACF3A7ACC327AE93A7ACD32
7C7AE42A77F1197CDE2177195800217B
--------------------------------
BLOCK 38
CC22060B217ACC217A8ECD700E7A72CD
73ABC3247305CABD7C7AE42A777AE93A
237AE22A7793CD6F777ACE3A197CDE21
0536195800217 84ACD6F7ACC327AE63A
--------------------------------
BLOCK 39
217734CD203CCD0036017C88117709CD
E03E7A9BCD229BCD033E7734CDFB107B
7CCD001011467AD92176C9CD7709CDD5
3EFF214349545341544E4146780BCD7A
--------------------------------
BLOCK 40
006EDD4E3017FE107EDDC510067B3921
DD011036DD0077DD1FE6093060FE7C78
65CD113817FE107EDDFB203D23DD3C0F
E67C7865CD7B3821DD6CC6C301367AC4
--------------------------------
BLOCK 41
190020110F3017FE107EDD1034DDE177
93CD6F7ACC221066DD006EDD71E51958
0021050E023013FE0618430E042015FE
040E7611DA10FE7E197CDE21784ACD5F
--------------------------------
BLOCK 42
32043E7AC632AF230036230036230036
7B5F21788FCD6CC6C37AC5320628FFFE
3D7AC53A7AC432AF774ECD5CB07BEDC9
A51023DDC17793CD182E347ACD214736
```

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BLOCK 43
015AE1115AE021FF3C3C202020204C45
56454C20202020202020202020202020
534556494C203E3E780BCD7ACC221700
21C9788FCDFB6CC6C37ADB32013E7AC5
--------------------------------
BLOCK 44
0110C17793CD192EC54D7ACC22170921
47C8B77AC53AFF0000780BCD76A83231
C67AC63A76A73240C602182A3E042009
FE7ADB3A7ACC22171B21B0ED6836001F
--------------------------------
BLOCK 45
CD1A2E170136DD7793CD1A2E000136DD
0077DDF5013EE42018FE3CF17793CD1A
2E1F0036DD7793CD1A2E000036DD0177
DDF57ACC21DDAFEE187ACC32790C0CC9
--------------------------------
BLOCK 46
1F5C483A807F117AAE32203EC9B0ED00
1F015AE1115AE021F61019DD1F77DD00
77DD1806580021DD002011B0ED001F01
7758011158002 1C9E4201FFE3CF17793
--------------------------------
BLOCK 47
D1776FC2B1780BFED301F6F8E67C7865
CD01F401D5E5C5F5C9F710C17AADCD1D
14C540061F1F1F5C483A60A0117AAE32
303EC9F710C17AADCD1D15C560061F1F
--------------------------------
BLOCK 48
241C771A241C771A241C771A241C771A
094F7ACC3A40066F0F0F0F94786718E6
477ACD3AEB192929 29636B8011C91FE6
867AC93A7AC72103187AD321C9F1C1E1
--------------------------------
BLOCK 49
227AC92A04361957E021777AD13A197C
BE21D17793CD6F7ACC227AC92A043619
580021777AD23AD5197CDE21782BCDC9
241C771A241C771A241C771A241C771A
--------------------------------
BLOCK 50
21EB7AD032477E197CDE21782BCDC978
4ACD6E2B5E7ACA21C9E323780CC323E1
347ACC21779CCDEB29296F0F2607E514
28FFFE7EE3C97793CD6F357ACD217ACC
--------------------------------
BLOCK 51
7B7B6121C95C76222B19292929EB19EB
2929EB19295D54235C762AC9EB190026
12CB23CB12CB23CB12CB23CB12CB23CB
12CB23CB0016C9B9C8B8153E4E19FFE0
--------------------------------
BLOCK 52
32413E7B5A32AF03B5CD00BC1107D021
0B367ACD21203CCD7C3F110036019F55
36FD7A8ECD320EC5797DDA79F7CD7A72
CDC977278E2B003E77278E7A2B772786
--------------------------------
BLOCK 53
201FFE1218413E042021FE807B593AFF
062F2035FE0618010604203 8FEFBFB28
00FE7E00365C0821FB779CCDEB29296F
0F26077B593A7ACC320EC67B5A3A7B59
```

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BLOCK 54
042B02FE7E7B5A21FB03B5CD00141107
A621777B593A197B5A5BED7B5C21A020
30FEA418FB03B5CD004F110050217B59
32203E022040FE04285BFE0A185A3E04
--------------------------------
BLOCK 55
CD4F0E7A72CDF2102BDD1B2B0F77DD1A
0077DD7E03067B5E117B6121EB200DF0
102BDD0F77DD0C7EDD0077DDFD7EDD03
060D4F173802FEF17B7321DD78BDC334
--------------------------------
BLOCK 56
CDEB29296F0F26077EC5E50306E10B00
36DD779CCD3D165F80C6878787E5C578
050036DD7B7421070136DD7ACC21DD01
06203CCDF25536FD7C7511001301 7A8E
--------------------------------
BLOCK 57
05067B6521DD000311C9F82047CBFEDB
EF3EFB20B1780B000001B6180134DD01
34DD083006FE7804C1E17A4DCD19FFEE
11140036DDE5EB100034DD23E1C1779C
--------------------------------
BLOCK 58
101323C00638BE1A03067B62117B5F21
7A4DCD7ACD32AF7ACC32073E7B5F21C9
37E11019DDD0012802BEDD7B613AC00A
3801BEDD7B603AC0133800BEDD7B5F3A
--------------------------------
BLOCK 59
2C02127750000148001140002 1AFC9DE
10E1347ACC21C1779CCDC5E53D165F80
C60FF0E603188787870FE623082840CB
7E06067ACC32193EFA101323127EC9F7
--------------------------------
BLOCK 60
79ED10EEF5202D6279ED10EE052025FE
0E0006C9F420BC5B3E24FA202C77A87E
5800213F06C9B0ED02FF015801117158
0021C97A7CCA58CB0414247A7CC20C1C
--------------------------------
BLOCK 61
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
000000000000000000000000C9EE106B
--------------------------------
BLOCK 62
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
--------------------------------
BLOCK 63
43434354545441414143434300000000
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
--------------------------------
BLOCK 64
1E050904050314020 60A0212100E0C0A
08060402000202020202020202020 2FF
01FF01FF01FF01FF011F1F1F1F141F1F
1F1F1F00000000000000000000484848
--------------------------------
BLOCK 65
4F462031040616 3A535345525004021 6
17171717171717171717171717171717
00000000000000000000000000000000
031911031D0E060B0E030D0B06170803
--------------------------------
BLOCK 66
1634382720444E494C5245562043495 2
45207F0714164B43495453594F4A204E
4F5453504D454B20524F462032040816
4C4F52544E4F4320524F535255432052
--------------------------------
BLOCK 67
2053275941444F5408021 63C534C4149
54494E492052554F59205245544E4520
4F543E0403164F52455A20444E412054
48474952202C5446454C204553550402
--------------------------------
BLOCK 68
00002E2E2E524544524148011202102 0
474E4954544547204552412053474E49
48540012021416 2E2E2E545542011201
13061101100D0D16545345544145524 7
--------------------------------
BLOCK 69
90C30000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
```

Treasure Hunt



CREATE WEALTH with **Treasure Finder** by G Hadjimichalakis of Nicosia, Cyprus. You have a metal detector and must search for buried treasure. The metal detector beeps when you move, and the higher the pitch of the beep the closer you are to something. Watch out though, there are tree stumps around and if you hit one you lose a treasure. **Treasure Finder** works on any Spectrum, and contains full instructions.

```
  10 POKE 23658,8: LET HI=0: BOR
DER 1: PAPER 7: INK 1: BRIGHT 1:
 CLS
  15 GO SUB 4000
  20 GO SUB 5000
  25 GO SUB 5500
  30 FOR T=1 TO 10
  40 LET N=T: LET MO=INT ((175*T
+95)/9): LET XM=15: LET YM=10: G
O SUB 6000
  50 CLS : PRINT AT YM,XM;CHR$ 1
44: PRINT #0;AT 0,0;"HS:";HI;AT
0,6;"*SCORE:";SC;AT 0,16;"**MOVE
S LEFT:";#1;AT 1,0;"* TREASURE F
INDER *TREASURES:";N
1000 PAUSE 1: PAUSE (50-50*T+900
)/9: LET MO=MO-1: IF MO=0 THEN
GO TO 8000
1010 LET M$(1)=STR$ MO: PRINT  0
;AT 0,29;M$(1)
1015 LET A$=INKEY$
1020 LET XM=XM+(A$="8" AND XM<31
)-(A$="5" AND XM>0): LET YM=YM+(
A$="6" AND YM<21)-(A$="7" AND YM
>0)
1030 PRINT AT YM,XM;CHR$ 144
1035 GO SUB 7300
1040 GO SUB 7000
2000 GO TO 1000
2100 NEXT T
2200 GO TO 30
4000 FOR I=0 TO 7: READ BI: POKE
 USR "A"+I,BI: NEXT I
4200 DATA 231,231,231,0,0,231,23
1,231
4210 RETURN
5000 RESTORE 5150: FOR I=0 TO 4:
 READ CR: FOR J=0 TO 31: PRINT A
T CR,J;CHR$ 144: NEXT J: NEXT I
5100 PRINT AT 1,8;"TREASURE FIND
ER";AT 4,0;"Using your metal det
ector you";AT 5,0;"have to find
hidden treasures.";AT 6,0;"When
getting closed to a trea-";AT 7,
0;"sure the sound of your metal
de-";AT 8,0;"tector is getting s
harper.";AT 9,0;"Once you find t
he treasures,you"
5110 PRINT AT 10,0;"proceed to t
he next stage with";AT 11,0;"one
 more treasure to find.";AT 14,1
0;"GOOD LUCK !";AT 18,7;"PRESS
""P"" TO PLAY"
5120 PAUSE 0: LET A$=INKEY$: IF
A$<>"P" THEN  GO TO 5120
5150 DATA 0,2,16,20,21
5200 RETURN
5500 LET SC=0: DIM X(10): DIM Y(
10): DIM D(10): DIM T$(1,2): DIM
 M$(1,3)
5600 RETURN
6000 CLS : PRINT AT 10,12;"STAGE
 ";T: PAUSE 50
6500 FOR I=1 TO T
6510 LET X(I)=INT (RND*32): LET
Y(I)=INT (RND*22)
6520 NEXT I
6530 FOR I=1 TO T
6540 FOR J=2 TO T
6550 IF I=J THEN  GO TO 6600
6560 IF X(I)=X(J) THEN  GO TO 66
20
6570 NEXT J
6600 NEXT I
6610 RETURN
6620 FOR K=1 TO T
6630 FOR L=2 TO T
6640 IF K=L THEN  GO TO 6700
6650 IF Y(K)=Y(L) THEN  GO TO 65
00
6690 NEXT L
6700 NEXT K
6710 GO TO 6570
7000 FOR I=1 TO T
7010 IF XM=X(I) AND YM=Y(I) THEN
  GO SUB 7100
7020 NEXT I
7050 RETURN
7100 LET N=N-1: LET SC=SC+10: IF
 N=0 THEN  GO SUB 7200: GO TO 21
00
7110 LET X(I)=100: LET Y(I)=100:
 LET T$(1)=STR$ N: BEEP .2,13: B
EEP .2,16: BEEP .2,10: BEEP .5,2
0: PRINT #1;AT 1,1; FLASH 1;"ONE
 LESS TREASURE";AT 1,29; FLASH 0
;T$(1): FOR I=1 TO 300: NEXT I:
PRINT #1;AT 1,1;" TREASURE FINDE
R ": PRINT  0;AT 0,13;SC
7115 BEEP .2,5: BEEP .5,15
7120 RETURN
7200 FOR I=10 TO 20: BEEP .02,I:
 BEEP .05,2*I: BEEP .07,I/2: NEX
T I: FOR I=10 TO 16 STEP 3: BEEP
 .2,I: NEXT I
7203 LET MOV=30*T-MO: LET EX=MO:
 LET SC=SC+EX
7205 CLS : FOR I=0 TO 31: PRINT
AT 6,I;CHR$ 144;AT 16,I;CHR$ 144
: NEXT I: PRINT AT 8,6;"CONGRATU
LATIONS !!!";AT 9,4;"YOU DID IT
IN ";MOV;" MOVES"
7207 PRINT AT 11,1;"EXTRA POINTS
 FOR STAGE ";T;" :";EX: PRINT AT
 12,8;"TOTAL SCORE :";SC: PRINT
AT 14,6;"WHEN READY PRESS ""R"""
7208 PAUSE 0: LET A$=INKEY$: IF
A$<>"R" THEN  GO TO 7208
7210 RETURN
7300 FOR I=1 TO T: LET D(I)=SQR
((XM-X(I))*(XM-X(I))+(YM-Y(I))*(
YM-Y(I))): NEXT I
7305 LET D=D(1)
7310 FOR I=1 TO T
7320 IF D(I)<D THEN  LET D=D(I)
7330 NEXT I
7340 LET S=(1370.3-78*D)/36: FOR
 I=1 TO 2: BEEP .2,S: NEXT I
7350 RETURN
8000 FOR I=30 TO 0 STEP -1: BEEP
 .005*I,I: NEXT I
8050 CLS : PRINT AT 5,13;"SORRY"
;AT 7,9; FLASH 1;" GAME IS OVER
": PRINT AT 10,11;"SCORE :";SC;A
T 13,4;"PRESS ""P"" TO PLAY AGAI
N"
8100 PAUSE 0: LET A$=INKEY$: IF
A$<>"P" THEN  GO TO 8100
8150 IF SC>HI THEN  LET HI=SC
8200 GO TO 25
```

DOMINOES

PLAY DOMINOES in a full machine-code version which, amazingly, runs on the expanded ZX-81. Written by David Gist of Hastings, Sussex, the game is for two players. Instead of dots, the dominoes use symbols from the keyboard. After five dominoes have been played, a new game starts, and the winner is the player with the fewest penalty points at the end.

Penalty points are accrued if you try to play an illegal domino. Unfortunately you are not allowed to see your own hand, but instead have a list of which symbols remain and how many. It is up to you to remember what has been played and work out what is left from the list.

To enter the game, first type in Listing One, making sure there are at least 450 characters in the REM statement. Then run the program, and type in the number in Listing Two as you are prompted. You will be asked to input five numbers and then a checksum. The checksum is indicated in the listing by an asterisk, but you should not enter the asterisk, just the number.

When the code has been successfully entered you should delete lines 10 to 140 and substitute a line 100 RAND USR 16567. Save a copy of the program before you try it out, or you may lose the lot if there is still a mistake.

Listing 1

```
   1 REM XXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXX
  10 LET X=16514
  20 IF X=16965 THEN STOP
  25 LET K=0
  30 FOR N=1 TO 5
  40 PRINT AT 0,0;"ENTER NUMBER"

  50 INPUT A
  60 PRINT A;" "
  70 POKE X,A
  75 LET K=K+A
  80 LET X=X+1
  90 NEXT N
 100 PRINT AT 0,0;"ENTER CHECK";
 110 INPUT A
 115 PRINT A
 120 IF K=A THEN GOTO 20
 130 PRINT "ERROR IN CHECKSUM"
 140 STOP
```

Listing 2

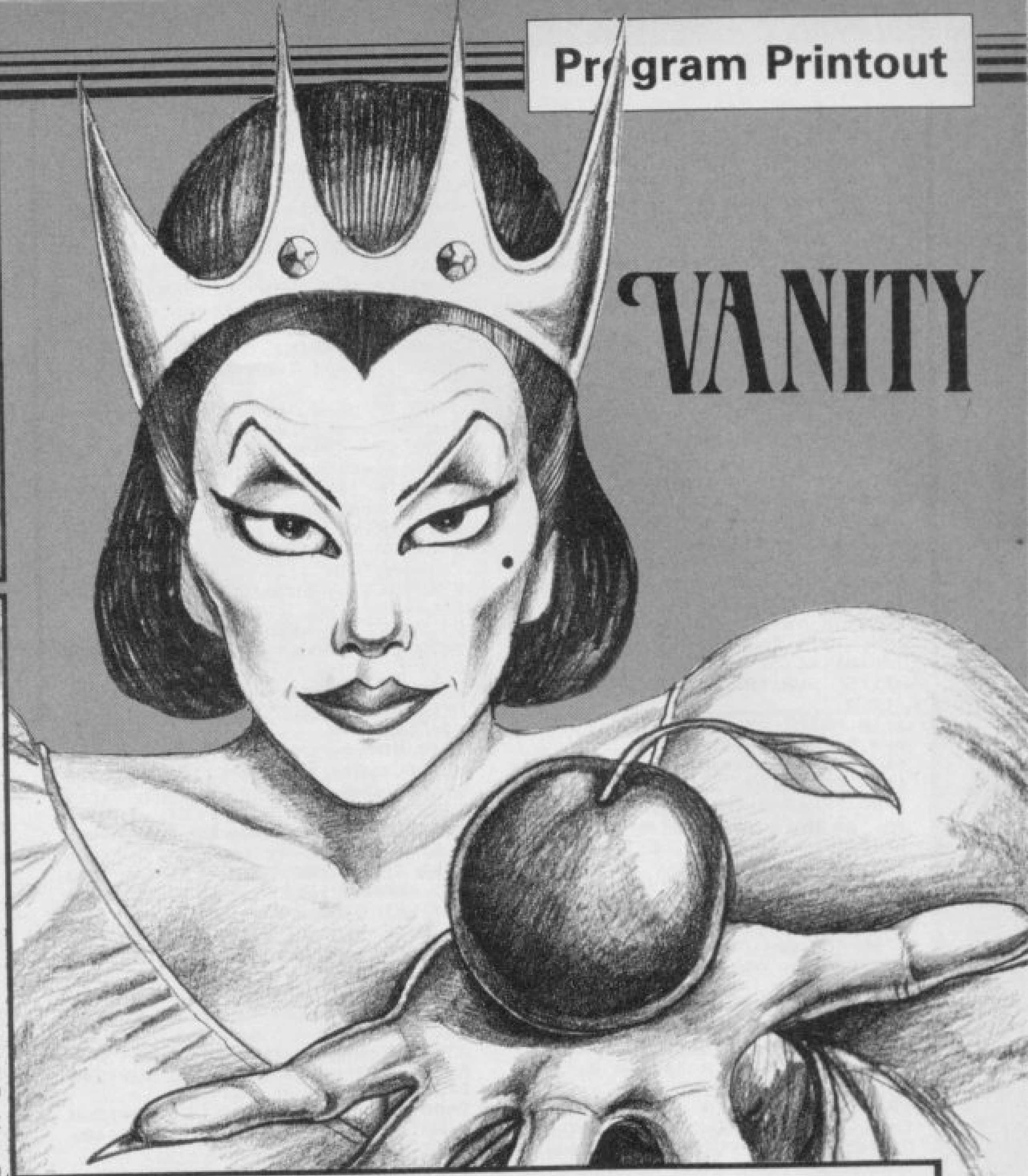
```
118   118   24    25    26    *311
28    29    32    33    34    *156
35    36    37    39    42    *189
44    46    209   26    19    *344
213   254   255   200   215   *1137
24    246   245   229   203   *947
71    40    5     33    113   *262
66    24    3     33    96    *222
66    126   254   165   32    *643
3     54    156   43    52    *308
225   241   201   205   147   *1019
64    0     0     128   49    *241
42    43    57    0     156   *298
156   128   41    52    50    *427
46    51    52    56    128   *333
55    46    44    45    57    *247
0     156   156   128   255   *695
245   1     0     1     205   *452
245   8     6     9     14    *282
30    175   215   13    32    *465
252   62    118   215   16    *663
244   241   60    32    43    *620
205   147   64    0     0     *416
128   13    8     34    128   *311
128   21    8     34    128   *319
128   12    8     34    128   *310
128   16    8     34    128   *314
128   23    8     34    128   *321
128   255   33    132   64    *612
17    93    64    14    16    *204
237   176   88    5     33    *539
161   64    126   238   8     *597
119   33    68    65    126   *411
238   8     119   4     32    *401
9     62    5     6     40    *122
33    0     32    24    6     *95
193   225   241   205   157   *1021
64    245   229   197   83    *818
30    2     203   71    32    *338
7     33    185   66    54    *345
177   24    5     33    66    *305
67    54    183   35    54    *393
157   213   229   205   187   *991
2     44    32    250   205   *533
187   2     37    68    77    *371
44    40    247   205   189   *725
7     126   33    142   67    *375
1     21    0     237   177   *436
225   209   32    14    29    *509
40    16    74    87    52    *269
121   186   40    213   167   *727
40    210   87    54    0     *391
90    24    147   54    0     *315
95    130   33    93    64    *415
14    15    237   177   32    *475
240   43    117   122   193   *715
225   213   229   22    2     *691
213   23    23    23    111   *393
38    30    22    8     62    *160
155   50    48    64    197   *514
213   22    8     94    203   *540
123   32    9     213   197   *574
229   205   178   11    225   *848
193   209   203   3     12    *620
21    32    237   35    209   *534
193   5     21    32    225   *476
209   21    40    4     193   *467
123   24    203   209   123   *682
6     2     197   33    142   *380
67    1     23    0     237   *328
177   193   35    53    187   *645
32    7     126   254   28    *447
32    2     24    51    122   *241
16    231   241   205   157   *850
64    254   5     32    6     *361
1     9     32    33    17    *92
32    254   4     32    6     *328
1     26    32    33    26    *118
40    254   3     32    6     *335
1     35    40    33    43    *152
40    254   2     32    6     *334
1     52    40    33    52    *178
32    61    194   60    65    *412
6     255   11    120   177   *569
32    251   195   215   64    *757
241   205   157   64    1     *668
10    5     205   245   8     *473
205   147   64    44    38    *498
50    42    0     52    59    *203
42    55    255   201   118   *671
```

DISPLAY TEXT

PRODUCE display-size lettering on the 48K Spectrum with **Display Text** by C. Moore of Redcar, Cleveland. His machine-code routine searches for the variable e$ which contains the text to be enlarged. It then generates an enlargement and stores it in the printer buffer prior to transmitting it to the screen. Text can be printed in three sizes, and the routine checks to make sure there is room on the line and the screen, scrolling the screen if necessary.

```
 10 DATA 42,75,92,126,254,128,2
00,254,69,40,41,230,224,254,96,3
2,6,17,6,0
 20 DATA 25,24,236,254,160,32,7
,35,203,126,40,251,24,239,254,22
4,32,6,17,19
 30 DATA 0,25,24,215,35,94,35,8
6,19,25,24,207,229,42,54,92,34,8
6,255,33
 40 DATA 81,255,126,254,2,56,5,
167,254,5,56,2,54,2,225,35,70,35
,35,4
 50 DATA 24,15,197,229,126,205,
5,254,205,148,254,205,33,254,225
,35,193,16,239,201
 60 DATA 17,8,0,42,54,92,36,214
,31,254,113,56,5,42,123,92,214,1
12,71,24
 70 DATA 1,25,16,253,34,76,255,
201,62,2,205,1,22,237,75,136,92,
58,81,255
 80 DATA 128,254,26,56,6,5,205,
217,13,24,238,58,81,255,167,185,
56,15,60,71
 90 DATA 62,13,215,16,251,237,7
5,136,92,4,205,217,13,33,0,91,37
,34,54,92
 100 DATA 58,81,255,245,237,75,1
36,92,4,13,205,217,13,241,61,32,
242,22,32,58
 110 DATA 81,255,95,71,197,213,2
37,75,136,92,123,12,61,254,0,32,
250,5,213,205
 120 DATA 217,13,209,67,122,215,
122,131,87,16,250,209,20,193,16,
224,42,86,255,34
 130 DATA 54,92,201,33,0,91,34,7
8,255,42,76,255,6,8,229,197,6,8,
110,197
 140 DATA 175,203,37,229,48,2,62
,1,50,80,255,205,192,254,225,193
,16,237,205,12
 150 DATA 255,193,225,35,16,224,
201,58,81,255,237,75,82,255,237,
91,84,255,245,58
 160 DATA 80,255,245,203,32,203,
33,48,2,203,192,58,81,255,254,2,
32,6,241,177
 170 DATA 79,195,253,254,203,34,
48,2,203,193,254,3,32,5,241,178,
87,24,9,203
 180 DATA 35,48,2,203,194,241,17
9,95,241,61,254,0,32,200,237,67,
82,255,237,83
 190 DATA 84,255,201,42,78,255,5
8,81,255,237,75,82,255,237,91,84
,255,229,245,112
 200 DATA 205,61,255,113,254,2,4
0,12,205,61,255,114,254,3,40,4,2
05,61,255,115
 210 DATA 241,225,35,61,254,0,32
,225,34,78,255,201,213,197,58,81
,255,71,17,8
 220 DATA 0,25,16,253,193,209,20
1,0,0,0,0,0,0,0,0,0,0,0,0
 225 RESTORE
 230 CLEAR 64928: BORDER 5: PAPE
R 7: INK 0: PRINT "Poking code,
please wait."
 260 LET check=0
 270 FOR a=64929 TO 65367: READ
code: POKE a,code: LET check=che
ck+code: NEXT a
 280 CLS : IF check<>50758 THEN
 PRINT "Incorrect Data entry !
          Please check thru Data l
isting": STOP
 290 PRINT "Code poked O.K.",,
 300 PRINT "Do you want to save
it? y/n"
 305 PAUSE 0
 308 IF INKEY$="n" THEN  GO TO 3
30
 310 CLS : PRINT "The code will
be saved under the  name 'larget
ext'": SAVE "largetext"CODE 6492
9,439
 315 PRINT ,,"Rewind tape and pl
ay to verify"
 320 VERIFY "largetext"CODE
 330 CLS : PRINT "The code is no
w stored above    RAMTOP (safe f
rom NEW),and is   ready to use."
 340 PRINT : PRINT "N.B. Wheneve
r you load the code from tape, p
lease remember to   CLEAR 64928
before loading."
 350 PAUSE 50
 360 PRINT : PRINT "To print lar
ge characters/udg's"
 370 PRINT : PRINT "for example
:- ";
 390 LET e$="HI-SCORE": POKE 653
61,2: RANDOMIZE USR 64929
 400 PRINT AT 11,0;"you simply d
o the following:-"
 410 PRINT : PRINT "  LET e$=''H
I-SCORE''"
 420 PRINT "  POKE 65361,2(or 3
or 4 for                  the si
ze you want)"
 430 PRINT "  RANDOMIZE USR 6492
9"
 440 PRINT : PRINT "The text is
printed starting    from the cur
rent print position."
 450 PRINT "You can print it any
where using PRINT AT_,_; before
RANDOMIZING."
```

VANITY



HAVE YOU ever wanted to be really evil? Stick the handsome prince one in the gut or beat up the seven dwarfs? Now is your chance in **Vanity** by Peter Catherall of Deeside, Clwyd.

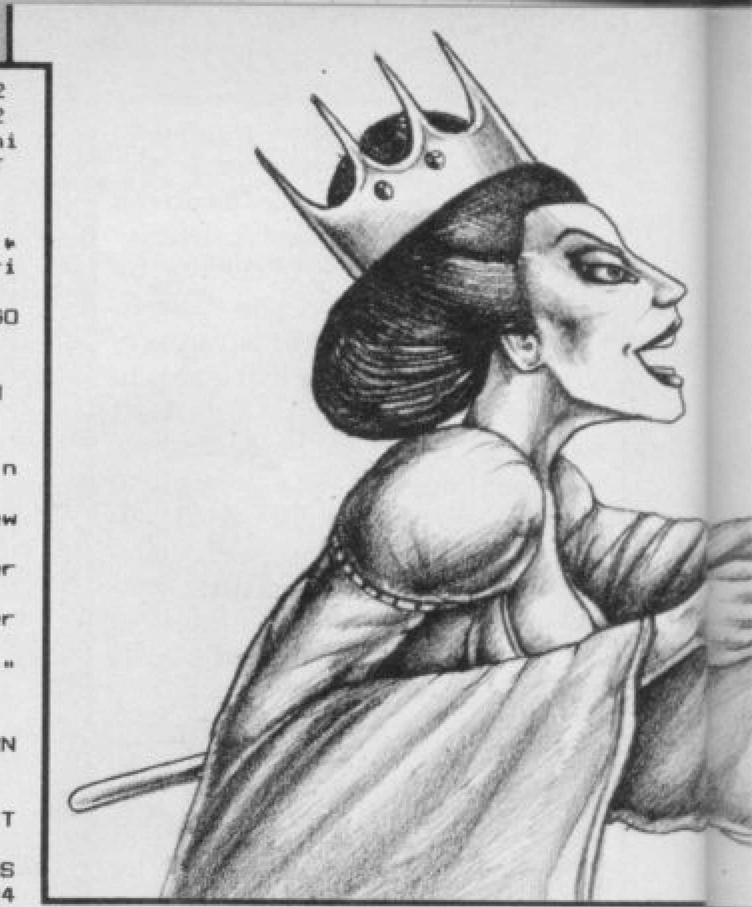
A 48K Spectrum text adventure, Vanity casts you as the evil queen in the Snow White story. You must set out with your basket of poisoned apples and attempt to become the fairest of them all. There are two methods of doing this — you can either increase your beauty through magical means, or simply slaughter anybody who looks prettier than you.

```
  10 REM ******* VANITY *******
  11 REM
  20 REM THE MAIN VARIABLES ARE:
  21 REM Lc=location number
  22 REM o$=object names
  23 REM o()=object number
  24 REM n$=list of names of
          potential victims
  25 REM v$=selected victim
  26 REM r1 to r10=random nos.
  27 REM f1 to f9=flags
  28 REM y=your beauty rating
  29 REM ***********************
  99 REM THE PROGRAM LISTING
 100 POKE 23609,25
 110 LET f1=0: GO SUB 7000: LET
f1=1
 120 REM ***********************
 499 REM INITIALISATION
 500 LET Lc=INT (RND*2)+1
 510 LET f2=0: LET f5=0: LET f6=
0: LET f7=0: LET f8=0: LET f9=0:
 LET f10=0: LET B=5: LET C=6: LE
T D=7: LET G=7: LET H=8: LET L=9
 520 LET W=9: LET S=15: LET y=10
: LET Z=1: LET cg=1: LET gk=1: L
ET hp=1: LET wi=1: LET U=10: LET
 strength=10
 530 LET n$="UBUCUDUGUHULUWUZUSU
"
 540 LET m$="HIGH ON A FOG SHROU
DED  MOUNTAIN"
 550 LET f$="ON A FORESTED HILLS
IDE"
 560 LET w$="IN A WOODED VALLEY"
 570 LET g$="IN A GOLD MINE"
 600 DIM o$(13,14): DIM o(13): D
IM d(6)
 610 RESTORE 620: FOR n=1 TO 13:
 READ q$: LET o$(n)=q$: NEXT n
 620 DATA "length of rope","silv
er musket","golden key","brass l
antern","crossbow","blunderbuss"
,"gold nugget","rusty iron key",
"BOOK OF SPELLS","jewelled sword
","MAGIC WAND","parchment map","
pickaxe"
 630 FOR n=1 TO 13: LET o(n)=0:
NEXT n
 700 PRINT AT 13,10; INK 3; FLAS
H 1;"SNOW WHITE"
 710 PRINT AT 19,3;"PRESS 'i' FO
R INSTRUCTIONS,        ANY OTHER
KEY TO PLAY."
 720 IF INKEY$="" THEN  BEEP .1,
0: BEEP .1,20: GO TO 720
 730 IF INKEY$="i" THEN  GO SUB
8000
 800 CLS : BORDER 3: PAPER 7: IN
K 0
 810 PRINT "YOU ARE IN FRONT OF
YOUR MIRROR.What it tells you ma
kes you veryangry. Pausing only
to collect abasket of poisoned a
pples, you  rush from the palace
...."
 820 PAUSE 150: BEEP .1,12
 830 REM ***********************
 999 REM MAIN LOOP
1000 BORDER 4: POKE 23692,255: L
ET f3=0: LET mh=0: LET bp=0
1010 RESTORE 9000+Lc: READ L$: F
OR n=1 TO 6: READ d(n): NEXT n
1020 PRINT '"YOU ARE ";L$;"."
1030 IF Lc<=24 THEN  GO SUB 2000
: IF f3=1 THEN  GO TO 1000
1035 IF Lc=38 OR Lc=39 THEN  GO
SUB Lc*100
1040 IF Lc>=30 AND Lc<=42 THEN
GO SUB 1900: IF Lc=35 THEN  LET
f4=0
1045 IF Lc>=43 AND Lc<=46 THEN
GO SUB Lc*100: IF Lc=25 THEN  GO
 TO 1010
1050 INPUT "What will you do? ";
 LINE a$
1060 IF a$="" THEN  GO TO 1050
1065 IF a$="dig" THEN  GO TO 120
0
1070 IF a$="open" THEN  GO TO 13
00
1075 IF a$="look" THEN  GO TO 15
00
1080 IF a$="take" THEN  GO TO 16
00
1090 IF a$="list" THEN  GO TO 17
00
1100 IF a$="beauty" THEN  GO SUB
 1800: GO TO 1050
1110 RESTORE 1140: FOR n=1 TO 6:
 READ c$: IF a$=c$ THEN  GO TO 1
150
1120 NEXT n
1130 PRINT  PAPER 1; INK 7;'" I
don't understand ";a$;". ": BEEP
 .2,-12: GO TO 1050
1140 DATA "north","east","south"
,"west","up","down"
1150 IF d(n)=0 THEN  PRINT  PAPE
R 1; INK 7;'" You can't go ";c$;
". ": BEEP .2,-12: GO TO 1050
1160 LET Lc=d(n): IF Lc<=52 THEN
 PRINT  PAPER 6;'" You went ";c
$;". ": BEEP .1,12
1170 IF Lc>=40 AND Lc<=42 OR Lc>
=49 AND Lc<=52 THEN  GO SUB Lc*1
00
1175 IF Lc>=53 THEN  GO TO Lc*10
0
1180 GO TO 1000
1190 REM ***********************
1199 REM DIG
1200 IF o(13)<>2 THEN  PRINT "Yo
u've got nothing to dig with.":
GO TO 1050
1210 IF Lc<>36 AND lc<>37 AND Lc
<>40 THEN  PRINT "You find nothi
ng.": GO TO 1050
1220 LET n=Lc-29
1230 IF o(n)<>0 THEN  PRINT "You
've dug here before. There's not
hing else to be found here.": GO
 TO 1050
1240 PRINT  INK 2;"You unearth a
 ";o$(n): BEEP .1,12: LET o(n)=1
: GO TO 1050
1250 REM ***********************
1299 REM OPEN
1300 IF Lc<>45 AND Lc<>47 AND Lc
<>48 THEN  PRINT "There is nothi
ng to open.": GO TO 1050
1310 IF Lc=45 THEN  GO SUB 4520:
 GO TO 1050
1320 IF Lc=47 THEN  GO SUB 4700:
 GO TO 1000
1330 IF Lc=48 THEN  GO SUB 4800:
 GO TO 1000
1340 REM ***********************
1499 REM LOOK
1500 IF Lc<=29 OR Lc>=43 OR Lc=3
6 OR Lc=37 OR Lc=40 THEN  GO TO
1550
```

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```
1510 IF Lc=38 OR Lc=39 THEN  PRI
NT "You see all there is.": GO T
O 1050
1520 LET n=Lc-29
1530 IF o(n)=0 THEN  PRINT  INK
2;"You find a ";o$(n): BEEP .1,1
2: LET o(n)=1: GO TO 1050
1540 IF o(n)=1 THEN  PRINT "You
see all there is.": GO TO 1050
1550 PRINT "You find nothing.":
GO TO 1050
1560 REM ***********************
1599 REM TAKE
1600 IF Lc<=29 OR Lc>=43 THEN  G
O TO 1640
1610 IF Lc=38 OR Lc=39 THEN  GO
TO Lc*100+10
1620 LET n=Lc-29
1630 IF o(n)=1 THEN  PRINT  INK
1;"You take the ";o$(n): BEEP .1
,12: LET o(n)=2: GO TO 1050
1640 IF mh=1 THEN  PRINT  INK 1;
'"You take the herb and eat it.
  It heals some of your scars an
d enhances your beauty.": BEEP .
1,12: LET y=y+1: GO SUB 1800: LE
T mh=0: GO TO 1050
1650 IF bp=1 THEN  PRINT  INK 1'
"You take the beauty potion and
 drink it.": BEEP .1,12: LET y=y
+1: GO SUB 1800: LET bp=0: GO TO
 1050
1660 PRINT "You see nothing to t
ake.": GO TO 1050
1670 REM ***********************
1699 REM LIST
1700 IF f7=0 THEN  LET p$="a bas
ket of poisoned apples"
1710 IF f7=1 THEN  LET p$="abolu
tely nothing"
1720 PRINT  INK 1;'"YOU ARE CARR
YING:": IF f7<=1 THEN  PRINT  IN
K 1;p$
1730 FOR n=1 TO 13: IF o(n)=2 TH
EN  PRINT  INK 1;"a ";o$(n)
1740 NEXT n
1750 GO TO 1050
1760 REM ***********************
1799 REM BEAUTY RATING
1800 PRINT  PAPER 3; INK 7;'" YO
UR BEAUTY RATING IS NOW ";y;". "
1810 IF y<=0 THEN  PRINT  INVERS
E 1;'"YOU ARE NOW SO UGLY YOU EA
T ONE OF YOUR POISONED APPLES AN
D DIE.": PRINT : GO TO 6050
1820 IF y>B AND y>C AND y>D AND
y>G AND y>H AND y>L AND y>W AND
y>S THEN  GO TO 6500
1850 RETURN
1860 REM ***********************
1899 REM REVEAL
1900 LET n=Lc-29
1910 IF o(n)=1 THEN  PRINT  INK
2;"You see a ";o$(n)
1920 RETURN
1930 REM ***********************
1999 REM RANDOM EVENTS
2000 IF Lc=3 THEN  GO SUB 2500:
RETURN
2005 LET r1=INT (RND*10)+1
2010 IF r1<=2 THEN  RETURN
2015 IF r1=3 AND y<9 THEN  PRINT
  INK 2;"You see a medicinal her
b.": LET mh=1: RETURN
2020 IF r1=4 AND Z=1 THEN  PRINT
  INK 2;"You meet a friendly wit
ch. She  offers you a beauty pot
ion.": LET bp=1: RETURN
2030 PRINT "You see a shadowy fi
gure.": PRINT "Will you "; INK 2
;"offer"; INK 0;" a poisoned app
le or "; INK 2;"run"; INK 0;" aw
ay?": PRINT
2040 INPUT "Make your choice: ";
 LINE a$: IF a$<>"offer" AND a$<
>"run" THEN  PRINT  PAPER 1; INK
 7;" You must ENTER ""offer"" or
 ""run""": GO TO 2040
2050 IF a$="offer" THEN  GO TO 2
120
2060 IF a$="run" THEN  PRINT "CO
WARD, you ran away."
2070 LET r2=INT (RND*4)+1
2080 IF r2=4 THEN  PRINT  INK 2;
"In your haste you fell into som
ebrambles and scratched your fac
e": LET y=y-1: GO SUB 1800
2090 IF Lc<12 THEN  LET Lc=Lc+2
2100 IF Lc>12 THEN  LET Lc=Lc-2
2110 PRINT '"When you stop runni
ng, you look about you...": LET
f3=1: RETURN
2120 LET r3=INT (RND*8)+1
2130 IF r3=1 THEN  PRINT "Your w
ould-be victim shuns your offeri
ng and runs away.": RETURN
2140 IF r3>=2 AND r3<=6 THEN  GO
 TO 2300
2145 IF U=0 THEN  RETURN
2150 PRINT "You've been savaged
by a bear."
2160 LET r4=INT (RND*4)+1
2170 IF r4=1 THEN  LET i$="no in
juries"
2180 IF r4=2 THEN  LET i$="a few
 scratches": LET y=y-1
2190 IF r4=3 THEN  LET i$="sever
e lacerations": LET y=y-2
2200 IF r4=4 THEN  LET i$="a ter
rible mauling": LET y=y-3
2210 PRINT "You receive ";i$;"."
2220 GO SUB 1800
2230 RETURN
2300 LET q=LEN n$: LET n=INT (RN
D*q)+1
2310 LET v$=n$(n)
2320 LET n$=n$( TO n-1)+n$(n+1 T
O )
2330 IF v$="B" THEN  LET v$="BAS
HFUL BARRY": LET sc=B: GO SUB 24
40: LET B=0
2340 IF v$="C" THEN  LET v$="CLU
MSY CLAUD": LET sc=C: GO SUB 244
0: LET C=0
2350 IF v$="D" THEN  LET v$="DOP
EY DICK": LET sc=D: GO SUB 2440:
 LET D=0
2360 IF v$="G" THEN  LET v$="GRU
MPY GRAHAM": LET sc=G: GO SUB 24
40: LET G=0
2370 IF v$="H" THEN  LET v$="HAP
PY HARRY": LET sc=H: GO SUB 2440
: LET H=0
2380 IF v$="L" THEN  LET v$="LOO
NIE LENNIE": LET sc=L: GO SUB 24
40: LET L=0
2390 IF v$="W" THEN  LET v$="WEA
RY WILLIE": LET sc=W: GO SUB 244
0: LET W=0
2400 IF v$="S" THEN  LET v$="SNO
W WHITE": LET sc=S: GO SUB 2440:
 LET S=0
2405 IF v$="U" THEN  PRINT "You'
ve killed a bear.";: LET U=U-1:
PRINT " There's"'"now ";U;" left
.": RETURN
2410 IF v$="Z" THEN  PRINT  INVE
RSE 1;"You've just killed the WI
TCH.   IDIOT, she was your only
friend.": LET Z=0: RETURN
2420 GO SUB 1800
2430 RETURN
2440 PRINT "You've just killed "
;v$
2450 IF sc<y THEN  PRINT "Dashed
 bad luck, ";v$;'"was uglier tha
n you anyhow.": RETURN
2460 PRINT  INK 3;"CONGRATULATIO
NS, ";v$;'"was fairer than you."
: GO SUB 6400: RETURN
2500 PRINT  INK 2;"Do you wish t
o enter and ask thehermit for di
rections?"
2510 INPUT "Enter cave? (yes or
no): "; LINE a$: IF a$<>"yes" AN
D a$<>"no" THEN  GO TO 2510
2520 IF a$="no" THEN  RETURN
2530 PRINT  INK 1;'"The hermit s
ays:"; INK 0;''"The Prince's Pal
ace is 2 miles  east, up the hil
l, then another 2 miles east."
2540 PRINT '"The gold mine is 2
miles south, down the hill, then
 1 mile southand 1 mile west."
2550 PRINT '"To get to the dwarf
s' house, youtake the road to th
e mine, but  instead of turning
west, head   south-east for 4 mi
les, and thengo south for one mi
le."
2560 RETURN
2570 REM ***********************
3799 REM CONDITIONAL EVENTS
3800 IF f8=0 THEN  PRINT  INK 2;
```



```
"Two green eyes peer at you from
 a dark recess. You hold up the
 lantern. You see a wise old owl
 perched on an ancient, leather-
 bound book."
3805 RETURN
3810 IF f8=1 AND o(9)<>2 THEN  P
RINT  INK 1;"You take the ";o$(9
): BEEP .1,12: LET o(9)=2: GO TO
 1050
3815 IF o(9)=2 THEN  PRINT "You
see nothing to take.": GO TO 105
0
3820 PRINT  INK 1;'"The owl says
:"; INK 2;'"'Before you can take
 this BOOK   OF SPELLS, I will p
resent you   with ten groups of
letters and  you must tell me ho
w many there are in each. If you
 run out of  time I will attack
you.'"
3825 PRINT  INK 2;'"'When you ar
e ready, press any   key and I w
ill begin.'": PRINT : PAUSE 0
3830 FOR n=1 TO 10: POKE 23692,2
55: LET r10=INT (RND*7)+3
3835 FOR a=1 TO r10: LET b=INT (
RND*26)+65: PRINT CHR$ b;: NEXT
a: PRINT ,: FOR f=10 TO -5 STEP
-1: BEEP .005,f: IF INKEY$<>STR$
 r10 THEN  NEXT f: PRINT  INK 1;
"out of time": BEEP .3,-12: GO T
O 3850
3840 PRINT  INK 2;"correct": BEE
P .1,0: BEEP .1,12: PRINT : NEXT
 n: GO TO 3860
3850 PRINT  INVERSE 1'"       THE
 OWL ATTACKS YOU.        ": LET y=
y-1: GO SUB 1800
3855 NEXT n
3860 PRINT  INK 3;'"CONGRATULATI
ONS. You've survivedthe ordeal.
The owl flies away.": PRINT : GO
 SUB 6400: LET f8=1: LET o(9)=1:
 GO TO 1000
3900 IF o(10)<>2 THEN  PRINT  IN
K 2;"You see a jewelled sword, i
ts   blade embedded in solid roc
k."
3905 RETURN
3910 IF f9=1 AND o(10)<>2 THEN
PRINT  INK 1;"You take the ";o$(
10): BEEP .1,12: LET o(10)=2: GO
 TO 1050
3915 IF o(10)=2 THEN  PRINT "You
 see nothing to take.": GO TO 10
50
3920 PRINT '"You try to withdraw
 the sword   from the rock but c
annot.": IF cg=1 THEN  PRINT "Yo
u must fight another Guardian.On
e awaits you to the north.": GO
TO 1050
3925 PRINT  INK 1;'"A voice says
```



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:"; INK 2;'"'Before you can take
 the sword   you must prove your
 mental      prowess. If you can
 add some    numbers together fa
ster than    I can, then the swo
rd will be   yours for the takin
g. If not,   then you must fight
 another of  my Guardians.'"
3930 PRINT '"When you are ready,
 press a key.": PAUSE 0
3940 PRINT '"Get ready";: BEEP .
1,0: PRINT ", Get set ";: BEEP .
1,0: PRINT  INK 4;"GO": BEEP .1,
12
3950 FOR n=1 TO 5: LET r8=INT (R
ND*5)+1: LET r9=INT (RND*5): POK
E 23692,255
3960 PRINT '"What is ";r8;" and
";r9;" ?  ";
3970 LET q=r8+r9: FOR f=r8*3+10
TO -5 STEP -1: BEEP .005,f: IF I
NKEY$<>STR$ q THEN  NEXT f: GO T
O 3990
3980 PRINT  INK 2;"correct": NEX
T n: PRINT  INK 3;'"CONGRATULATI
ONS. You have earnedthe right to
 take the sword.": GO SUB 6400:
LET f7=2: LET f9=1: GO TO 1000
3990 PRINT  INK 1;"out of time":
 BEEP .2,0: PRINT ''"I won, the
answer is ";q'"Before you can tr
y again or re- cross the bridge
you must defeatanother Guardian.
": LET cg=1: GO TO 1000
4000 LET f2=1: RETURN
4100 IF o(4)=2 THEN  PRINT "You
light the ";o$(4)
4110 IF o(4)<>2 THEN  PRINT "In
the darkness you fell down   som
e stairs into a cellar.": GO SUB
 6000: LET Lc=32
4120 RETURN
4200 IF f4=1 THEN  RETURN
4210 IF o(1)<>2 THEN  PRINT "You
 fell. You had no rope.": GO SUB
 6000: LET Lc=35: RETURN
4220 PRINT "You lowered yourself
 into the   mine using the ";o$(
1);"."
4230 IF o(4)<>2 THEN  PRINT "How
ever, in the darkness you    fal
l down a disused mineshaft.": GO
 SUB 6000: LET Lc=35: RETURN
4240 IF o(12)<>2 THEN  PRINT  IN
VERSE 1;"YOU HAVE NO MAP AND ARE
 DESTINEDTO WANDER THE MINE UNTI
L YOU DIE": PRINT : GO TO 6050
4250 PRINT "You light the ";o$(4
);'"and consult the ";o$(12): LE
T f4=1: RETURN
4300 IF gk=0 THEN  RETURN
4310 LET p$="a ": LET e$="GALLAN
T KNIGHT": GO SUB 5500
4320 IF a$( TO 3)="mag" THEN  LE
T gk=0: RETURN
4330 IF a$( TO 3)="cro" AND o(5)
=2 THEN  PRINT  INK 3;"CONGRATUL
ATIONS. YOU HAVE KILLEDTHE ";e$;
".": GO SUB 6400: LET gk=0: RETU
RN
4340 IF (a$( TO 3)="sil" AND o(2
)=2) OR (a$( TO 3)="blu" AND o(6
)=2) THEN  PRINT "BAD LUCK. You
only wound him.   You are forced
 to retreat back  across the dra
wbridge.": LET Lc=25: RETURN
4350 PRINT  INVERSE 1;"THE ";e$;
" KILLS YOU.   ": PRINT : GO TO
6050
4400 IF hp=0 THEN  RETURN
4410 LET p$="THE ": LET e$="HAND
SOME PRINCE": GO SUB 5500
4420 IF a$( TO 3)="mag" THEN  LE
T hp=0: RETURN
4430 IF a$( TO 3)="jew" THEN  PR
INT  INK 3;"CONGRATULATIONS. YOU
 HAVE KILLED";p$;e$;".": GO SUB
6400: LET hp=0: RETURN
4440 PRINT  INVERSE 1;"BAD LUCK.
 ";p$;e$;"   ";'"KILLS YOU STONE
 DEAD.            ": PRINT : GO T
O 6050
4500 IF f6=0 THEN  PRINT "The do
or to the WIZARD's cell   is loc
ked.": RETURN
4510 IF f6=1 THEN  PRINT "The ce
ll door is wide open.": RETURN
4515 IF o(8)<>2 THEN  PRINT "You
 cannot open it. You do not  hav
e the key.": RETURN
4520 PRINT '"Are you absolutely
sure?": INPUT "Open cell? (yes o
r no) "; LINE a$
4525 IF a$<>"yes" THEN  RETURN
4530 PRINT '"You unlock the cell
 door using  the ";o$(8);"."
4535 IF wi=0 THEN  PRINT "The ce
ll is empty.": RETURN
4540 PRINT : PRINT  PAPER 2; INK
 7;"CONGRATULATIONS. YOU HAVE FR
EED THE WICKED WIZARD.
    "
4545 IF o(9)=2 AND o(11)=2 THEN
 PRINT  PAPER 2; INK 7;"YOU HAVE
 RETURNED TO HIM HIS    MAGIC WA
ND AND BOOK OF SPELLS.","HE REWA
RDS YOU WITH GREAT BEAUTY": GO T
O 6500
4550 PRINT "However, he is unabl
e to reward you with great beaut
y because   you have not returne
d to him his"
4555 IF o(9)<>2 AND o(11)<>2 THE
N  PRINT o$(9);" and ";o$(11): G
O TO 4590
4560 IF o(9)<>2 THEN  PRINT o$(9
)
4565 IF o(11)<>2 THEN  PRINT o$(
11)
4570 PRINT "So you have no choic
e but to go back to the woods an
d carry on  killing until you're
 the fairestperson left in all t
he land.": LET wi=0: RETURN
4600 IF cg=0 THEN  RETURN
4610 PRINT  INK 2;"On the bridge
 stands a fearsome Guardian of t
he Cavern. You mustdefeat him in
 battle."
4620 PRINT '"Choose a key in the
 top row. Oneof them will kill t
he Guardian. Your strength is ";
strength: LET r7=INT (RND*10)
4630 PAUSE 0
4640 IF INKEY$=STR$ r7 THEN  PRI
NT  INK 3;'"CONGRATULATIONS. You
 have thrownthe Guardian off the
 bridge intothe raging torrent f
ar below.": GO SUB 6400: LET cg=
0: RETURN
4650 LET strength=strength-1: IF
 strength=0 THEN  GO TO 4670
4660 PRINT '"You lost that time,
 try again.  Your strength is no
w ";strength;".": BEEP .2,0: GO
TO 4630
4670 PRINT  INVERSE 1;'"BAD LUCK
. You're now too weak toresist a
nd the Gardian hurls youfrom the
 bridge to your death inthe ragi
ng torrent below.      ": PRINT
 : GO TO 6050
4700 IF o(3)<>2 THEN  PRINT '"Yo
u don't have the key.": BEEP .1,
0: RETURN
4710 IF f9=1 THEN  PRINT "There
is nothing to open.": RETURN
4720 PRINT '"You unlock the grea
t oak door   with the ";o$(3): B
EEP .1,12
4730 PRINT  INK 1;'"A voice says
:"; INK 2;'"'Enter at your peril
, for only   the strong and quic
k thinking   will return. Will y
ou dare to   enter my domain, ye
s or no?'"
4740 INPUT "Yes or no? "; LINE a
$: IF a$<>"yes" AND a$<>"no" THE
N  GO TO 4740
4750 IF a$="no" THEN  PRINT '"Th
e great oak door relocks      it
self.": RETURN
4760 PRINT  INK 2;'"'So be it. B
ut first I'll take   all your po
ssessions.'"; INK 1;''"Your poss
essions vanish."; INK 0;''"You p
ass through the portals of the g
reat oak door. It closes, reloc
king itself behind you..."
4770 LET f7=1: FOR n=1 TO 13: IF
 o(n)=2 THEN  LET o(n)=3
4780 NEXT n: LET Lc=48: RETURN
4800 IF f9=0 THEN  PRINT "You do
n't have the key.": BEEP .2,0: R
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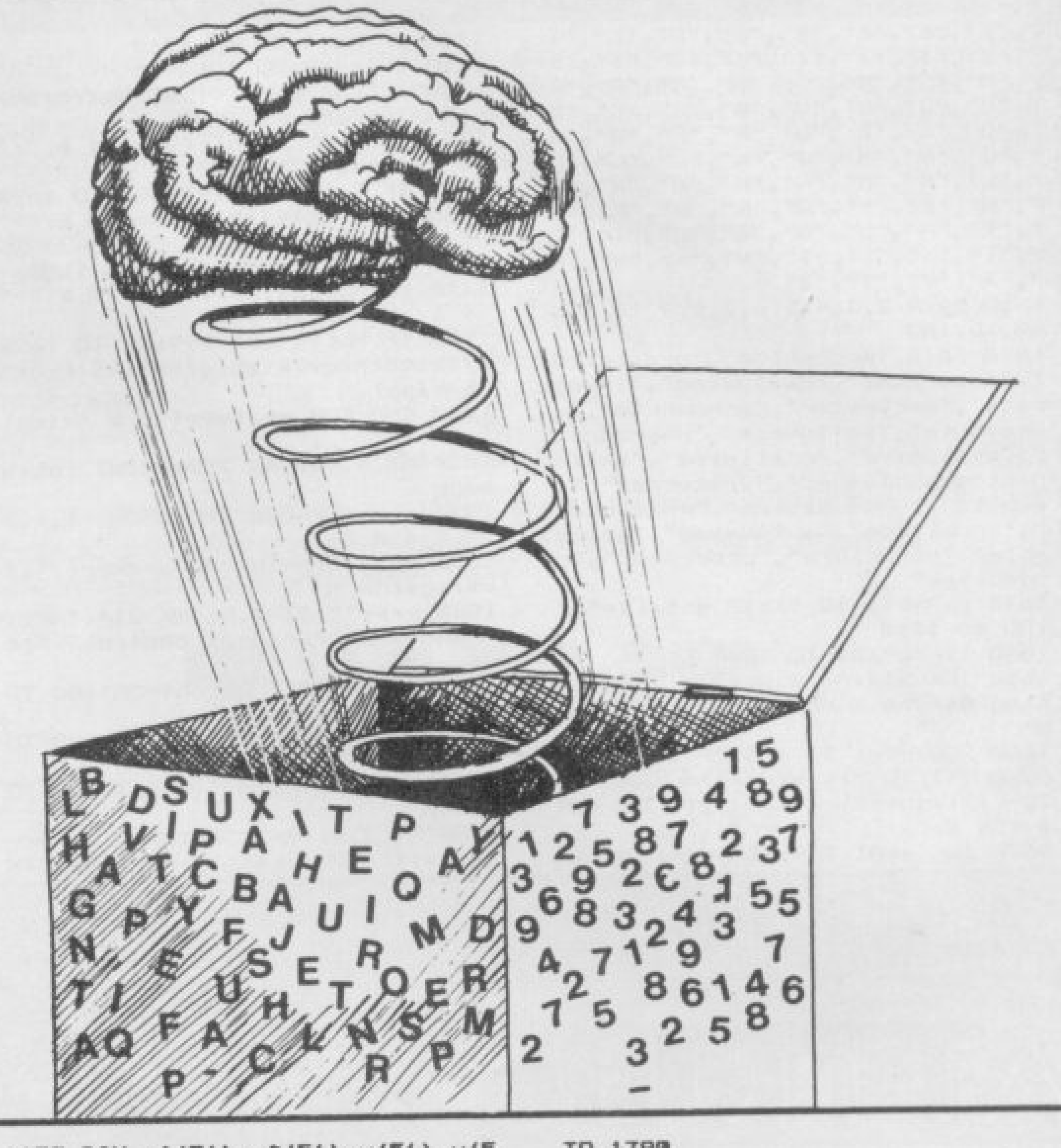
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ETURN
4810 PRINT "There is nothing to
open.": GO TO 5410
4900 PRINT '"YOU HAVE FALLEN INT
O AN OLD WELL": GO SUB 6000: LET
 Lc=30: RETURN
5000 IF o(11)<>2 THEN  PRINT "Yo
u have circled the battlementsan
d are back where you started.":
GO TO 5040
5010 LET r8=INT (RND*2)+1
5020 IF r8=1 THEN  PRINT '"The c
ourt jester tries to steal your
MAGIC WAND but fails.": GO TO 50
40
5030 PRINT '"The court jester st
eals your     MAGIC WAND and toss
es it off      the battlements int
o the chasm.": LET o(11)=0
5040 LET Lc=29: RETURN
5100 PRINT '"You see a fabulous
castle on theother side of the c
hasm."
5110 IF o(7)<>2 THEN  PRINT "The
 drawbridge remains raised.": LE
T Lc=25: RETURN
5120 PRINT "You bribe the sentry
 with your  gold nugget. He lowe
rs the draw-bridge and you cross
 over.": LET o(7)=0: LET Lc=43
5130 RETURN
5200 IF f2=1 THEN  PRINT "You fi
nd a pathway up the side  of the
 chasm.": LET f2=0: GO TO 5220
5210 PRINT "THE EDGE GIVES WAY A
ND YOU FALL.": GO SUB 6000
5220 LET Lc=25: RETURN
5300 IF f9=0 THEN  PRINT  PAPER
1; INK 7;" You can't. The passag
e south is blocked by a great oa
k door.   ": BEEP .1,0: LET Lc=4
7: GO TO 1050
5310 PRINT : PRINT  PAPER 6;" Yo
u went south. ": BEEP .1,12: LET
 Lc=48: GO TO 1000
5400 IF f9=0 THEN  PRINT  PAPER
1; INK 7;" You can't. The passag
e north is blocked by a great oa
k door.   ": BEEP .1,0: LET Lc=4
8: GO TO 1050
5410 IF f7=2 THEN  PRINT "The gr
eat oak door vanishes in  front
of your eyes, and all yourposses
sions are returned to you.": PRI
NT
5420 LET f7=0: FOR n=1 TO 13: IF
 o(n)=3 THEN  LET o(n)=2
5430 NEXT n: PRINT : PRINT  PAPE
R 6;" You went north. ": BEEP .1
,12: LET Lc=47: GO TO 1000
5500 PRINT  INK 2;"You meet ";p$
;e$;"."; 'You must fight him."
5510 PRINT : PRINT  INK 1;"YOU H
AVE THE FOLLOWING WEAPONS: poiso
ned apples"
5520 IF o(2)=2 THEN  PRINT  INK
1;o$(2)
5530 IF o(5)=2 THEN  PRINT  INK
1;o$(5)
5540 IF o(6)=2 THEN  PRINT  INK
1;o$(6)
5550 IF o(10)=2 THEN  PRINT  INK
 1;o$(10)
5560 IF o(11)=2 THEN  PRINT  INK
 1;"or you could try the MAGIC W
AND."
5570 PRINT
5580 INPUT "Choose a weapon: ";
LINE a$: IF LEN a$<3 THEN  PRINT
  PAPER 1; INK 7;" I don't under
stand ";a$;" ": BEEP .2,-12: GO
TO 5580
5590 IF a$( TO 3)<>"poi" AND a$(
 TO 3)<>"sil" AND a$( TO 3)<>"cr
o" AND a$( TO 3)<>"blu" AND a$(
TO 3)<>"jew" AND a$( TO 3)<>"mag
" THEN  GO TO 5580
5600 IF a$( TO 3)<>"mag" THEN  R
ETURN
5610 IF o(11)<>2 THEN  PRINT  PA
PER 1; INK 7;" You don't have it
. ": GO TO 5580
5620 LET r6=INT (RND*2)+1
5630 PRINT  INK 2;"You wave the
MAGIC WAND and ... THE ";e$;" tu
rns into a"
5640 IF r6=1 THEN  PRINT  INK 2;
"frog and you stamp on him and
 squash him dead.": GO SUB 6400:
 RETURN
5650 PRINT  INK 2;"fiery DRAGON.
 With one snort he "; INK 0; INV
ERSE 1;"BURNS YOU TO DEATH.
        ": PRINT : GO TO 6050
5660 REM ***********************
5999 REM DEATH OR INJURY
6000 LET r7=INT (RND*3)+1
6010 IF r7=1 THEN  PRINT "YOU'RE
 LUCKY. You scramble out  unhurt
.": RETURN
6020 IF r7=2 THEN  PRINT "BAD LU
CK. You receive serious   injuri
es.";: LET y=y-2: IF y>0 THEN  P
RINT " However, you manage tostr
uggle out alive."
6030 IF r7=2 THEN  GO SUB 1800:
RETURN
6040 PRINT  INVERSE 1;"THE FALL
HAS BROKEN YOUR NECK.  ": PRINT
6050 BORDER 0
6060 RESTORE 6060: FOR n=1 TO 11
: READ t,p: PAUSE 1: BEEP t,p: N
EXT n
6070 DATA .66,0,.66,0,.2,0,.66,0
,.46,3,.2,2,.46,2,.2,0,.46,0,.2,
-1,.66,0
6080 GO TO 7100
6090 REM ***********************
6399 REM BORDER ROUTINES
6400 FOR t=1 TO 5: FOR n=0 TO 7:
 BORDER n: BEEP .01,10: BEEP .01
,20: NEXT n: NEXT t: BORDER 4: R
ETURN
6500 FOR t=1 TO 20: FOR n=0 TO 7
: BORDER n: BEEP .01,10: BEEP .0
1,20: NEXT n: NEXT t: CLS
6510 REM ***********************
6999 REM MIRROR ROUTINE
7000 PAPER 7: INK 0: BORDER 3: C
LS
7010 PRINT AT 1,12;"VANITY";AT 2
,4;"by PETER CATHERALL (1985)"
7015 PRINT  PAPER 3;AT 4,0;"
                               "
7020 FOR n=0 TO 27: PRINT AT 7,n
+2;"MIRROR, MIRROR, ON THE WALL,
"(n+1): BEEP .05,6: NEXT n
7030 FOR n=0 TO 29: PRINT AT 8,n
+1;"AMONG THE PEOPLE OF THIS LAN
D,"(n+1): BEEP .05,6: NEXT n
7040 FOR n=0 TO 29: PRINT AT 9,n
+1;"WHO'S THE FAIREST OF THEM AL
L?"(n+1): BEEP .05,6: NEXT n
7050 IF f1=0 THEN  RETURN
7060 PRINT  INK 7; PAPER 3; FLAS
H 1;AT 17,8;"THOU, O QUEEN"
7070 REM ***********************
7099 REM NEW GAME
7100 INPUT "ANOTHER GAME (y or n
)? "; LINE a$
7110 IF a$="y" OR a$="Y" THEN  R
UN
7120 BORDER 7: PAPER 7: INK 0: C
LS : STOP
7130 REM ***********************
7999 REM INSTRUCTIONS
8000 PAPER 7: BORDER 7: CLS
8010 PRINT "You are a vain and w
icked Queen who's obsession is t
o become thefairest person in th
e land. But your mirror tells yo
u SNOW WHITEis fairer. So you mu
st kill her "
8020 PRINT "with one of a limitl
ess supply  of poisoned apples.
However, on your travels you may
 be savaged by a bear and receiv
e some very nasty injuries which
 could make"
8030 PRINT "you even uglier than
 some of theseven dwarfs. Death
also lies inwait for you. Howeve
r, if you   can rescue the Wicke
d Wizard and"
8040 PRINT "return to him his MA
GIC WAND andBOOK OF SPELLS he wi
ll make you more beautiful than
Snow White. So, off you go in se
arch of SnowWhite or the Wicked
Wizard. Havea nice evil day."
8050 PRINT AT 21,3; INVERSE 1;"P
RESS ANY KEY TO CONTINUE"
8060 PAUSE 0: IF INKEY$<>"" THEN
  CLS
8080 PRINT "When you're asked ""
What will youdo now?"" ENTER:-"
8090 PRINT "   north        east
     up        south        west
     down      look - to look aro
und            take - to pick up
what you see   list - to list wha
t you have     dig  - to unearth
objects        open - to open doo
rs             beauty-to check yo
ur score"
8100 PRINT '"When asked ""Do you
 want to offera poisoned apple o
r run away?""  ENTER:-"
8110 PRINT "    offer - to attemp
t to kill       run   - to escape
 possible               attack by
 a bear"
8120 PRINT '"When asked to ""Cho
ose a weapon"" ENTER one of thos
e listed"
8130 PRINT AT 21,8; INVERSE 1;"P
RESS ANY KEY"
8150 PAUSE 0: IF INKEY$<>"" THEN
  CLS : RETURN
8160 REM ***********************
9000 REM LOCATIONS DATA
9001 DATA f$,8,13,16,12,0,0
9002 DATA f$,13,17,20,16,0,0
9003 DATA "BY THE HERMIT'S CAVE"
,0,4,7,0,0,0
9004 DATA f$,0,5,0,3,0,0
9005 DATA f$,0,0,9,4,6,0
9006 DATA m$,0,25,10,0,0,5
9007 DATA f$,3,8,12,0,0,0
9008 DATA f$,0,0,1,7,9,0
9009 DATA f$,5,10,0,0,0,8
9010 DATA m$,6,0,0,9,0,13
9011 DATA f$,0,12,14,0,0,0
9012 DATA f$,7,1,0,11,0,15
9013 DATA f$,0,0,2,1,10,0
9014 DATA f$,11,15,0,0,0,35
9015 DATA w$,0,0,18,14,12,0
9016 DATA f$,1,2,0,0,0,0
9017 DATA f$,0,0,21,2,0,0
9018 DATA w$,15,19,0,35,0,0
9019 DATA w$,0,0,22,18,20,0
9020 DATA f$,2,21,0,0,0,19
9021 DATA f$,17,0,24,20,0,0
9022 DATA w$,19,23,0,0,0,0
9023 DATA w$,0,0,30,22,24,0
9024 DATA f$,21,0,0,0,0,23
9025 DATA "AT THE EDGE OF A CHAS
M",52,51,52,6,0,52
9026 DATA g$,36,0,0,42,0,0
9027 DATA g$,42,28,47,0,0,0
9028 DATA g$,0,37,0,27,0,0
9029 DATA "UP ON THE BATTLEMENTS
",50,0,50,0,38,43
9030 DATA "IN THE GARDEN AT THE
   DWARFS' COTTAGE",23,31,32,49,
0,0
9031 DATA "IN A SMALL SMITHY",0,
0,33,30,0,0
9032 DATA "IN THE DWARFS' PARLOU
R",30,33,0,0,0,41
9033 DATA "IN THE DWARFS' KITCHE
N",31,0,0,32,34,0
9034 DATA "IN THE DWARFS' LOFT",
0,0,0,0,0,33
9035 DATA "AT THE ENTRANCE TO AN
  OLD GOLD MINE",0,18,0,0,14,42
9036 DATA g$,0,40,26,0,0,0
9037 DATA "AT THE BOTTOM OF A WE
LL",0,0,0,28,30,0
9038 DATA "IN A ROOM AT THE TOP
OF THE TALLEST TURRET",0,0,0,0,0
,29
9039 DATA "IN A VAST CAVERN",46,
0,0,0,0,0
9040 DATA "AT THE BOTTOM OF A DE
EP CHASM",52,0,0,36,0,0
9041 DATA "IN THE DWARFS' CELLAR
",0,0,0,0,32,0
9042 DATA g$,0,26,27,0,35,0
9043 DATA "IN THE CASTLE COURTYA
RD",44,0,0,25,29,0
9044 DATA "IN THE THRONE ROOM",0
,0,43,0,0,45
9045 DATA "DOWN IN THE DUNGEONS"
,0,0,0,0,44,0
9046 DATA "ON A BRIDGE SPANNING
A  RAGING TORRENT",48,0,39,0,0,0
9047 DATA g$,27,0,53,0,0,0
9048 DATA "IN A DIMLY LIT PASSAG
E",54,0,46,0,0,0
```

BRAINBOX

SET YOUR synapses whirling with **Brainbox** by Mike Sever of Sale in Cheshire. Based on a popular TV quiz game, you have to form words from jumbled letters and, given a set of random numbers, try and get as close as possible to a given total. **Brainbox** was written for the QL. There are two listings. The second should be saved with Save mdvl_count B.

***Brainbox** uses our special abbreviations for graphics characters so read the instructions on the first page of Program Printout before entering the listings.*



Listing one

```
100 MODE 4:WINDOW 512,256,0,0:PA
PER 2:INK 7:BORDER 2,2,7:CLS:CSI
ZE 2,1
110 UNDER 1:AT 0,12:INK 4:PRINT"
C O U N T D O W N"
120 PRINT:INK 7:UNDER 0:PRINT"Th
is game is adapted from the tele
vision  series testing observati
on and arithmetic skill, consist
ing of 3 parts."
130 PRINT:INK 4:PRINT"1) Letters
 game:";:INK 7:PRINT"Either you
or the computerchoose 9 letters
( either consonant or    vowel )
 and then have 30 seconds to mak
e  as long a word as possible."
140 INK 0:AT 11,14:PRINT"PRESS A
NY KEY"
150 IF INKEY$="":GO TO 150
160 CLS:BEEP 2000,20:INK 4:PRINT
"2) Numbers game:";:INK 7:PRINT"
 The computer chooses 6   number
s then chooses a random number
    between 1 and 999.You have 3
0 seconds to  evaluate the rando
m number using any of   the 6 nu
mbers once only.After the 30
  seconds the computer will give
 an answer."
170 INK 4:PRINT"3) Conundrum:";:
INK 7:PRINT" Firstly yourself or
 the    computer enters a 9 lett
er word.The          computer then
jumbles it up and prints thejumb
led letters on the screen and yo
u have30 seconds to work it out.
"
180 AT 11,14:INK 0:PRINT"PRESS A
NY KEY"
190 IF INKEY$="":GO TO 190
200 PAPER 7:LRUN mdv1_countdownF
```

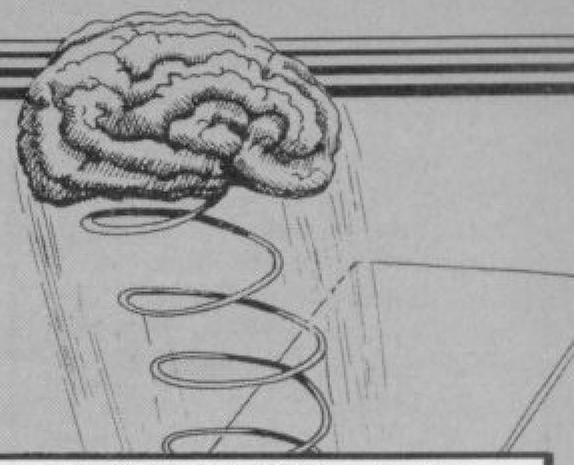
Listing two

```
1000 RESTORE :intro
1010 DEFine PROCedure space
1020 AT 0,0:PRINT FILL$("(sp)",3
2)
1030 END DEFine space
1040 DEFine PROCedure intro
1050 WINDOW 1,512,256,0,0:PAPER
0:INK 2:CLS
1060 CSIZE 3,1:AT 0,3:INK 2:PRIN
T"C  O  U  N  T  D  O  W  N"
1070 AT 2,14:INK 4:PRINT"B Y"
1080 AT 4,7:PRINT"M . A . S E V
E R":INK 2
1090 CIRCLE 70,30,20:INK 2:LINE
70,30 TO 70,49
1100 INK 4:AT 10,10:PRINT"Press
a key"
1110 IF INKEY$="":rj=RND(1):GO T
O 1110
1120 BEEP 2000,20:AT 10,10:PRINT
"(11*sp)":CIRCLE 70,30,20
1130 z$="":q=0:ra=0:con=0
1140 END DEFine intro
1150 DIM v$(56),w$(56),v(56),w(5
6),u(8),u2(8),k(6),wo$(24,9),lf$
(9),lf(9)
1160 FOR n=1 TO 42:READ v$(n):EN
D FOR n
1170 FOR n=1 TO 56:READ w$(n):EN
D FOR n
1180 FOR m=1 TO 8:READ u(m):END
FOR m
1190 FOR m=1 TO 5:READ u2(m):END
 FOR m
1200 FOR p=1 TO 24:READ wo$(p):E
ND FOR p
1210 FOR n=1 TO 56:v(n)=0:w(n)=0
:END FOR n
1220 AT 4,0:PRINT FILL$("(sp)",3
0)
1230 AT 0,0:INK 209:INPUT"Do you
 wish to play the LETTERS game (
l),the NUMBERS game (n),orthe CO
NUNDRUM (c):-";k$
1240 IF k$="l":AT 0,27:PRINT FIL
L$("(sp)",57):GO TO 1280
1250 IF k$="n":AT 0,27:PRINT FIL
L$("(sp)",57):GO TO 1650
1260 IF k$="c":AT 0,27:PRINT FIL
L$("(sp)",57):con=1:GO TO 1840
1270 AT 2,19:PRINT"(6*sp)":GO TO
 1230
1280 AT 0,0:INK 214:INPUT"Random
 or Personal choice ?";c$:IF c$=
"r" OR c$="R":ra=1:GO TO 1310
1290 IF c$="p" OR c$="P":GO TO 1
310
1300 AT 0,27:PRINT"(5*sp)":GO TO
 1280
1310 FOR q=1 TO 9
1320 IF ra=1:GO TO 1630
1330 AT 0,0:INPUT"Vowel or Conso
nant (V or C):";l$
1340 IF l$="v" OR l$="V"THEN GO
TO 1390
1350 IF l$="c" OR l$="C"THEN GO
TO 1370
1360 GO TO  1330
1370 x=RND(55)+1:IF w(x)=1 THEN
GO TO 1370
1380 w(x)=1:z$=z$&"(sp)"&w$(x):G
O TO 1410
1390 x=RND(41)+1:IF v(x)=1 THEN
GO TO 1390
1400 v(x)=1:z$=z$&"(sp)"&v$(x):G
O TO 1410
1410 INK 4:AT 3,6:PRINT z$:INK 7
1420 AT 0,28:PRINT"(2*sp)":END F
OR q
1430 space:clock:PAUSE 200:RECOL
 1,4,3,5,2,6,0,0:again
1440 DEFine PROCedure clock
1450 p=PI*2/420:x=0:y=0:s=0:BEEP
 2000,20:INK 2
1460 x=SIN(p*s)*19:y=COS(p*s)*19
1470 LINE 70,30 TO 70+x,30+y:s=s
+1
1480 IF con=0:GO TO 1500
1490 IF INKEY$="s":GO TO 1970
1500 IF s>=420:GO TO 1520
1510 BEEP 1,50:GO TO 1460
1520 INK 0:LINE 70,30 TO 70,49:B
EEP 2000,20:INK 122:AT 4,12:PRIN
T"TIME UP"
1530 RECOL 7,2,3,4,5,6,7,0
1540 END DEFine clock
1550 DEFine PROCedure again
1560 space:AT 0,0:INK 240:INPUT"
Another go (Y or N):";ag$:IF ag$
="y" OR ag$="Y":intro:GO TO 1210
1570 IF ag$="n" OR ag$="N":CLS:S
TOP
1580 AT 0,20:PRINT"(9*sp)":GO TO
 1560
```

continued on page 96

continued from page 95

```
1590 END DEFine again
1600 DATA "A","A","A","A","A","A
","A","A","A","E","E","E","E","E
","E","E","E","E","E","E","E","I
","I","I","I","I","I","I","I","I
","O","O","O","O","O","O","O","O
","U","U","U","U","B","B","C","C
","D","D","D","D","F","F","G","G
","G","H","H","J","K","L","L","L
","L","M","M","N","N","N","N","N
","N","P","P","Q","R","R","R","R
","R","R","S","S","S","S","T","T
","T","T","T","T","V","V","W","W
","X","Y","Y","Z"
1610 DATA 2,3,4,5,6,7,8,9,10,25,
50,75,100
1620 DATA "mechanism","ordinates
","numerical","evaluated","integ
rate","perimeter","announced","p
arachute","influence","phenomena
","explosive","critisism","astro
naut","published","yesterday","t
echnique","education","existence
","knowledge","automated","adapt
able","structure","processor","o
bjective"
1630 g=RND(1 TO 9):IF g<5:l$="v"
:GO TO 1340
1640 l$="c":GO TO 1340
1650 INK 214:AT 0,0:PRINT"Genera
ting Random Numbers...":PAUSE 18
0
1660 FOR dk=1 TO 4 STEP 3:k(dk)=
u2(RND(1 TO 5)):k(dk+1)=u(RND(1
TO 8)):k(dk+2)=u(RND(1 TO 8)):EN
D FOR dk
1670 INK 4:AT 2,9:FOR ge=1 TO 6:
PRINT k(ge);" ";:END FOR ge
1680 tot=k(1):fv$=k(1):FOR sb=2
TO 6
1690 hs=RND(1 TO 12):IF hs=1:GO
TO 1740
1700 IF hs<4:GO TO 1760
1710 IF hs<8:GO TO 1780
1720 IF tot/k(sb)<>INT(tot/k(sb)
):GO TO 1690
1730 tot=tot/k(sb):fv$=fv$ & ";"
 & k(sb):GO TO 1800
1740 IF tot+k(sb)>999:GO TO 1690
1750 tot=tot+k(sb):fv$=fv$ & "+"
 & k(sb):GO TO 1800
1760 IF tot-k(sb)<1:GO TO 1690
1770 tot=tot-k(sb):fv$=fv$ & "-"
 & k(sb):GO TO 1800
1780 IF tot*k(sb)>999:GO TO 1690
1790 tot=tot*k(sb):fv$=fv$ & "x"
 & k(sb)
1800 END FOR sb:fv$=fv$ & "=(sp)
" & tot
1810 AT 4,14:INK 250:PRINT tot:s
pace
1820 clock:PAUSE 200:RECOL 1,4,3
,5,2,6,0,0
1830 AT 4,0:PRINT"An answer: ";f
v$:again
1840 yx$="":AT 0,0:INK 214:INPUT
"Random or Personal choice ? ";c
h$
1850 IF ch$="r" OR ch$="R":GO TO
 1900
1860 IF ch$="p" OR ch$="P":GO TO
 1880
1870 AT 0,27:PRINT"(5*sp)":GO TO
 1840
1880 AT 2,0:INK 236:INPUT"Word:-
";vz$:IF LEN(vz$)<>9:AT 2,0:PRIN
T FILL$("(sp)",32):GO TO 1880
1890 le$=vz$:AT 2,0:PRINT FILL$(
"(sp)",32):GO TO 1910
1900 le$=wo$(RND(1 TO 24))
1910 FOR qs=1 TO 9:lf(qs)=0:lf$(
qs)=le$(qs):END FOR qs
1920 FOR ux=1 TO 9
1930 cj=RND(1 TO 9):IF lf(cj)=1:
GO TO 1930
1940 yx$=yx$ & "(sp)" & lf$(cj):
lf(cj)=1:END FOR ux
1950 space:AT 0,0:INK 2:PRINT"Pr
ess 'S' to stop clock.":PAUSE 18
0:space:AT 2,6:INK 4:PRINT yx$:c
lock
1960 PAUSE 200:RECOL 1,4,3,5,2,6
,0,0:AT 4,7:PRINT"Answer: ";le$:
again
1970 AT 0,0:INPUT"Your answer:-"
;am$:IF LEN(am$)<>9:space:GO TO
1970
1980 IF am$=le$:AT 4,5:INK 155:P
RINT"CORRECT in ";INT(s/14);" se
conds":again
1990 AT 4,0:INK 155:PRINT"WRONG,
 the answer was ";:INK 250:PRINT
 le$:again
```



ATTRIBUTE AID

PAPER and ink colours, flash and bright are all attributes of a particular character square. The details are held in the attributes file, which you can POKE and PEEK directly to find or change the contents.

Attribute Aid by Bill Davison and Mark Broomfield of Hornchurch, in Essex, runs on any Spectrum and can be used to discover the attributes of a particular combination of graphics information, or display the graphics corresponding to a particular attribute number. That can be useful since the four attributes are combined into a single number between 1 and 255, and thus the program saves you the trouble of working out the sums in advance and possibly making a mistake.

The program uses our special abbreviations for graphics characters, so please read the instructions on the first page of Program Printout before entering the listing.

```
   1 REM Attribute Aid.
 Bill Davison & Mark Broomfield
        October   1984
   2 REM ---------------
   3 FLASH 0: BRIGHT 0: BORDER 7
: PAPER 7: INK 0: CLS
   4 PRINT AT 2,2;" A T T R I B
U T E    A I D ";AT 4,8;  Octo
ber  1984";AT 6,0;" Bill Davison
 & Mark Broomfield"
   5 PRINT  PAPER 6; INK 2;AT 8,
7;"  OPTIONS  PAGE  ";AT 11,4;"
1 - to FIND  ATTRIBUTE";AT 13,4;
" 2 - to ENTER ATTRIBUTE"
   6 PRINT  FLASH 1;AT 17,2;"Pre
ss either key 1 or key 2"
   7 PRINT AT 20,0;            "
(ENTER anything except a number)
(    to return to this page.    )
"
   8 LET z$=INKEY$: IF CODE z$<4
9 OR CODE z$>50 THEN  GO TO 8
   9 CLS : GO TO 10↑(VAL z$)
  10 REM Find Attr. number
  15 INPUT "Flash= "; LINE x$: G
O SUB 300: LET f=VAL x$
  20 INPUT "Bright= "; LINE x$:
GO SUB 300: LET b=VAL x$
  25 INPUT "Paper= "; LINE x$: G
O SUB 300: LET p=VAL x$
  30 INPUT "Ink= "; LINE x$: GO
SUB 300: LET i=VAL x$
  35 IF f<0 OR f>1 OR b<0 OR b>1
 OR p<0 OR p>7 OR i<0 OR i>7 THE
N  PRINT AT 10,8; FLASH 1; BRIGH
T 1; INK 2;"INPUT ERROR"; FLASH
0; INVERSE 1;AT 11,8;"Flash<>";f
;AT 12,8;"Bright<>";b;AT 13,8;"P
aper<>";p;AT 14,8;"Ink<>";i;AT 1
6,2;"Press any key to correct...
": BEEP 1/2,-10: BEEP 1/2,-20: P
AUSE 0: FOR y=10 TO 16: FOR x=0
TO 31: PRINT AT y,x;"(sp)": NEXT
 x: NEXT y: GO TO 10
  40 PRINT AT 3,0;"Flash=";f;AT
4,0;"Bright=";b;AT 5,0;"Paper=";
p;AT 6,0;"Ink=";i
  50 PRINT AT 0,0; FLASH f; BRIG
HT b; PAPER p; INK i;"  Mark Bro
omfield  ": PRINT AT 2,0;"Attr.n
o.=";ATTR (0,0);"(2*sp)"
  60 GO TO 10
 100 REM Input Attr. number
 110 INPUT "Attribute no.= "; LI
NE x$: GO SUB 300
 120 LET attr=VAL x$
 125 IF attr<0 OR attr>255 THEN
 PRINT #0; FLASH 1; INK 2;" OUT
OF RANGE! ": BEEP 1/2,-10: BEEP
1/2,-20: PAUSE 100: GO TO 110
 130 PRINT AT 0,0;"  Bill Daviso
n  ";AT 2,0;"(32*sp)";AT 2,0;"At
tr.no.=";attr
 140 FOR a=22528 TO 22543: POKE
a,attr: NEXT a
 150 PRINT AT 3,0;"Flash=";INT (
attr/128)
 160 PRINT AT 4,0;"Bright=0": IF
 (attr>=64 AND attr<=127) OR (at
tr>=192 AND attr<=255) THEN  PRI
NT AT 4,7;1
 170 LET attr=attr-(128 AND attr
>=128): LET attr=attr-(64 AND at
tr>=64)
 180 PRINT AT 5,0;"Paper=0     ":
 LET p=INT (attr/8): PRINT AT 5,
6;p
 190 PRINT AT 6,0;"Ink=0     ":
LET i=attr-(p*8): PRINT AT 6,4;i
 200 GO TO 100
 300 IF CODE x$<48 OR CODE x$>57
 THEN  RUN
 310 RETURN
```

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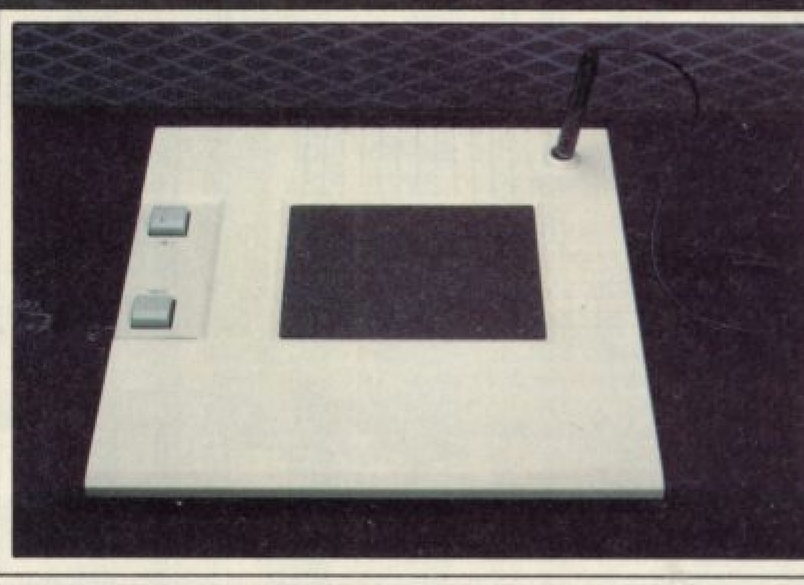
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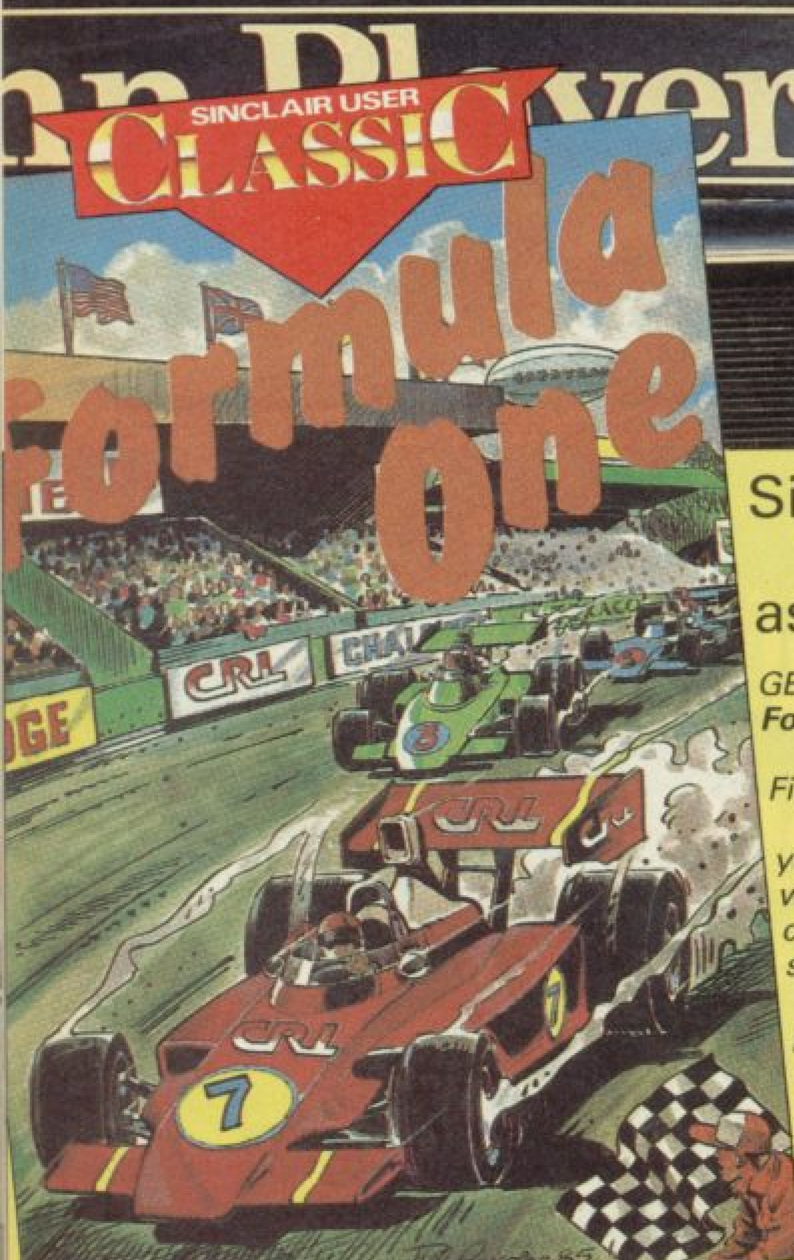
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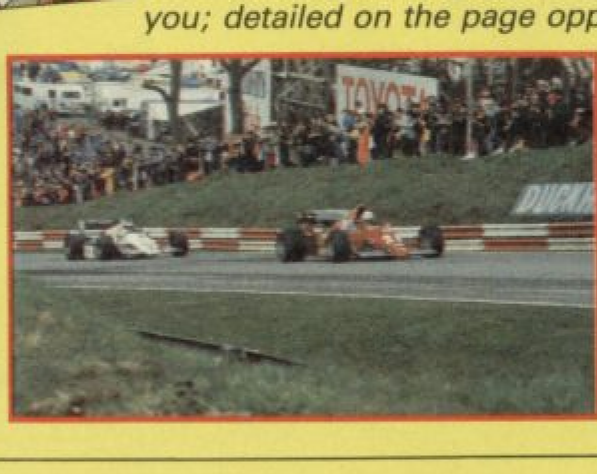
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Formula One *was one of the first games to receive* Sinclair User Classic *status, reserved for those programs which set new standards for software. CRL is offering 100 copies of this classic program to the winners of our competition; and if you have already bought the game, there's a special competition just for you; detailed on the page opposite.*







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4=	de Angelis	6pts			
4=	Rosberg	6pts			
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THE TABLES above show the results after two Grands Prix in a game of **Formula One**. The scoring system is as follows: nine points for a win, seven points for second place, four points for third, three points for fourth, two points for fifth and one point for sixth place.

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Alain Prost won the South African Grand Prix.

Who won the Brazilian Grand Prix, and what make of car came second?

Write the answers on a postcard together with your name, address and telephone number and send them to us at Formula One Competition, *Sinclair User*, Priory Court, 30-32 Farringdon Lane, London EC1R 3AU to arrive not later than June 21.

Grand Prix video cassette to be won

*IF YOU already have a copy of **Formula One**, you can still win a worthwhile prize. CRL is offering a handsome VHS video-cassette entitled **Grand Prix of the Decade** to the champion player of the game.*

*If you have beaten **Formula One** at expert level, a screen will appear with results and a code at the bottom. Take a photograph of the frame with the code. You must also provide photographic evidence of the game year in which you achieved the feat.*

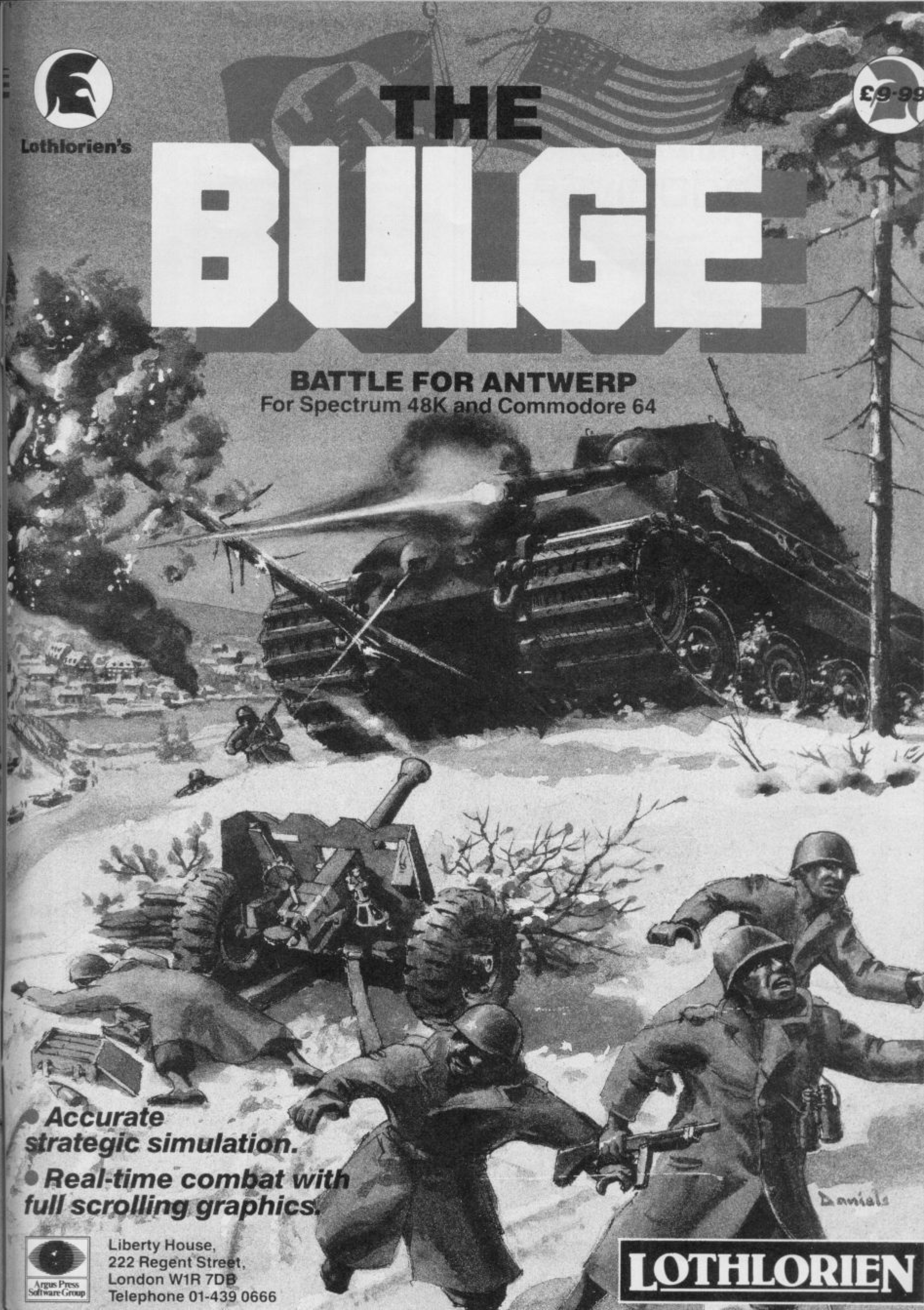
Whoever manages to win the Constructors' Championship at expert level in the quickest time will win the video. In the event of several people achieving that, the names will go in to the hat.

*Send you photographs to Code Competition, **Sinclair User**, Priory Court, 30-32 Farringdon Lane, London EC1R 3AU not later than June 21. Don't forget to include your name and address.*

The competition will be judged by CRL. Employees of EMAP or CRL, their friends and associates, are not allowed to enter.




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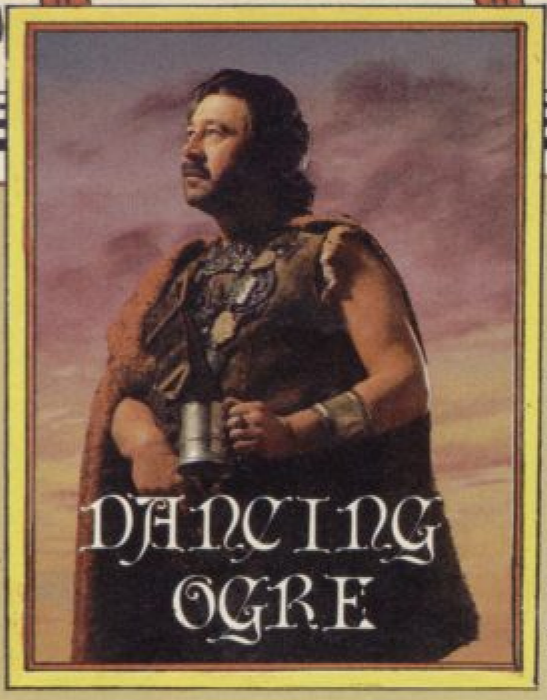
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SU



Gordo receives a despairing letter and meets some weary travellers

MY FRIENDS, I write with heavy heart and grim foreboding. As I rested at Samarrak, intending to visit its fabled market, a weary and travel-stained Royal Courier rode in, his horse well-nigh dead beneath him.

I knew him well — 'twas Argivven of Ashron and he bore the message of his comrade Robert the Woodward, Courier of Northern Eshak and the Marches. Grievous tidings indeed the letter contained, thus he wrote:

"Gordo, a sorry state the Ogre *is in, O stout one! I have barely escaped with my life from that troll hole. Only with some nifty swordwork and a smokescreen spell I learnt from Ragnak the Wizard could I escape. Uginnuk has filled the place with more of his kind and human bones litter the bar and floor. As I rest here in the woods that border your inn to the east, I hurriedly put quill to parchment before any pursuit ensues . . . but I see lights approaching through the trees and my nostrils fill with the smell of troll — I must flee."*

Woeful news indeed and worse than I had expected. More than ever it reinforces the old saying that the only good troll is a petrified troll! I curse Lord Janga by all the bones of Ithukk for dragging me away from home — what may have become of my strongbox? How shall I survive my old age?

As I wandered disconsolate around the market booths I met Moranna of Yel, an acquaintance of my youth. My spirits rose when she agreed to travel north on my behalf. With her were three mercenaries of Urtuun, Brothers of the Axe. These are fell warriors and the lady more dangerous still. So they rode off that afternoon — with their purses heavier each by forty gold pieces and my pockets the emptier.

At the long table of The Damaged Dragon *that night, I began to feel calmer. Fortified by many tankards of ale I talked with the gathered company. A large group had come from the land of* **Tir Na Nog** *and were bewildered by its intricacies.*

Anstey of Galashiels could not escape the empty lands of Tir Falahm. I could give him no easy answer, as the only way is to make a full map of the area. There is indeed a door but it will only be found by careful exploration and mapping.

A Sidhe Hater of Mirfield had become trapped in the great library — again no exit could he find. He told me that he had found some scrolls therein — those contain the answer. One is in a strange tongue and can be ignored, but the other two appear to be jumbled letters, perhaps a code. Code indeed — the smaller of the scrolls reads F4 B3. By moving the first letter of the longer text four letters forward in the alphabet and the next letter three backwards — and so on — a message will appear. There may lie Sidhe Hater's answer.

Now a number of those lost souls, including Drakkar Christiansen of Hvidavic and Guald of Tunbridge, could not pass the searing fire of the guardian serpent in Ceardac Callum.

This foul snake will destroy anything which it can see so, naturally, to slide past requires powerful magic and invisibility. On your journeys it may well be that some of you have found the severed halves of a torc. Once joined together they will confer the power of invisibility. But beware — the cauldron you may discover beyond the serpent is an object of power and will nullify the torc's power. Seek the back door and an egg for an N.

The Viking of Hvidavic was pleased with that but pressed me further on the doors marked F and C. F is an exit from another place and will generally work only one way, whilst C can be opened by listening to the sound of the letter. Can you hear the waves? Beside them is usually sand. Seek some amongst mouldering books and scrolls.

Remember too you weary ones who seek the Crown of Cernos — stags need antlers not metal crowns. There are red herrings even in the Celtic afterworlds.

Further into the night the talk turned to the mystery of **System 15000.** *Like others, Dave the Desperate and Maynard of Barford had had difficulty in using the services of Selcra. Again I say — to gain information, seekers must write SELCRA followed by the name of the company they are interested in on the System's message board. Those agents of darkness will only reveal information about a very few firms and you should not expect unlimited assistance.*

It seems that many more have broken the System's spell and I thank Egbert the Edbanger of Bristol and George Forsyth of Kingston for the advice they have given me.

As the drink flowed the boasting began. Blagger Kerr of 49 Newton Crescent, Dunblane, Perthshire rose to say he had completed the **Hobbit** *and* **Hampstead.** *He will offer full help if you send him 50 pence for postage and paper costs.*

Rambo the Rover of 56, Broadmark Road, Slough, Berkshire has a fair knowlege of **Eureka.** *He requests payment for his answers so you should contact him to negotiate terms. Rambo provided the answer to Orcslayer's plea for help in blowing up the bridge safely. First type D, then attach the dynamite, then type V,S and use the dynamite.*

Alex the Messenger of Solihull followed me out for a breath of air and confided he could not leave his hotel whilst hunting **Valkyrie 17.** *The window will provide an exit but Alex must first move along the ledge, explore the other room there and read a book he will find therein. Descent and escape should then be easier — do not use the front door.*

Rawle of Witham joined us outside so we held each other up and complained he could not impress Pippa as he strove for **Hampstead**ness. *Cease this pointless effort and be direct — go GET her, lad!*

So to bed but sleep I could not. My thoughts fell ever on the Ogre. *Moranna may be trusted, though, and I must save my strength for the long road ahead. There are many things I must purchase at the market before I continue and so little time, so little time . . .*

'Til next moon, riders of the roads, farewell.

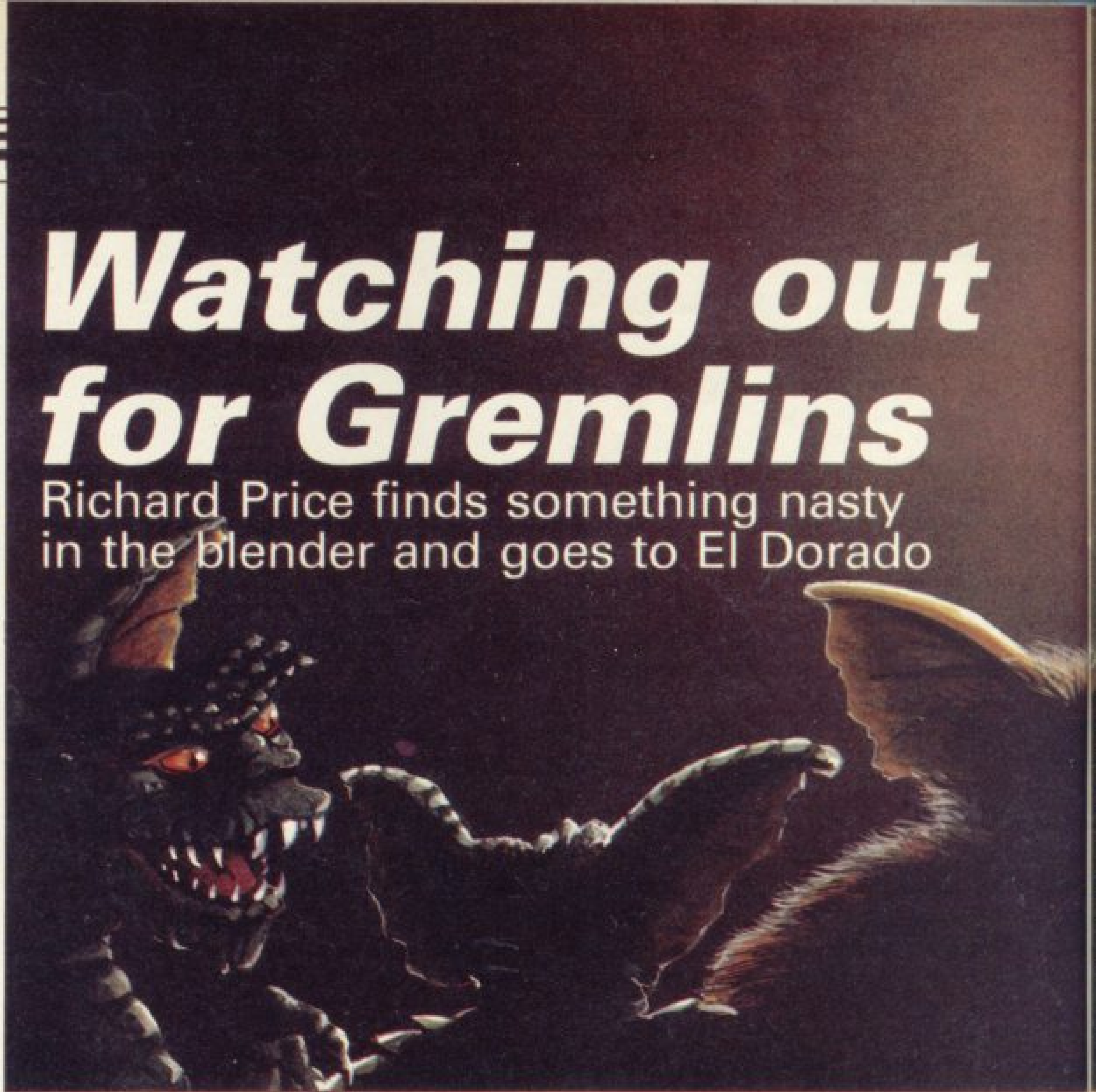
Greatbelly

Gordo Greatbelly, Landlord — perhaps.

If you have a tale to tell, or are in need of a helping hand, write to the Landlord of the Dancing Ogre c/o Sinclair User, Priory Court, 30-32 Farringdon Lane, London EC1R 5BH.



Directory of Dealers appears on page 127.



Watching out for Gremlins

Richard Price finds something nasty in the blender and goes to El Dorado

IF YOU are like me, it may take something more than an electric cattle prod to get you to a movie about little furry creatures, however lovable or terrifying they may be. That being the case, I approached **Gremlins** with trepidation, a large bucketful of salt and a lack of any knowledge of the story behind the title.

Gremlins

It came as a surprise to find that those wee beasties were every bit as fearsome as the meanest orc or ill-tempered dragon. They make East End football supporters look like choirboys.

The game comes from the Adventure International stables and is a text adventure with graphics. The plot probably makes more sense if you saw the film but in essence it is simple — which is more than can be said for the solution.

The all-American township of Kingston Falls is bedevilled by a plague of gremlins, furballs gone bad. Led by Stripe, arch-apostle of ultra-violence, they threaten to overwhelm the town and destroy civilisation as Ronald McDonald knows it. All in all, the classic transatlantic fear of the 'other'.

You take the part of Billy, hero of the film, and must do your darnedest to save the town and neutralise the evil hordes. Gizmo the Mogwai — I presume he is a good form of gremlin — will assist you once you manage to find him.

The game operates on the standard verb/noun format and has a fast and friendly interpreter. You may even get



free hints if you labour too long over a particular task — helpful if you are not over-familiar with aspects of day-to-day reality in the US.

Finding myself in a kitchen full of appliances I could not get any to work. After I had dithered for a while the computer suggested I 'press button'. Enlightenment came to me as I realised that the Peltzer remote control I had picked up ran the kitchen as well as TV. Have you heard of a Peltzer? I always thought they were dogs.

The pictures in **Gremlins** are not only pretty; they interact with the play and will show you the actions you have carried out if they affect your visible environment. Some are even partially animated. Once I had discovered the joys of the Peltzer I was soon watching a gremlin whizzing around in the blender.

Time is important to the play and you will have to flash around town to avoid roving gremlins. Leisurely exploration is not on — so, besides the need to solve problems you must always keep one eye open. That adds considerably to the excitement and urgency of your task and gives a feel of ever-present danger.

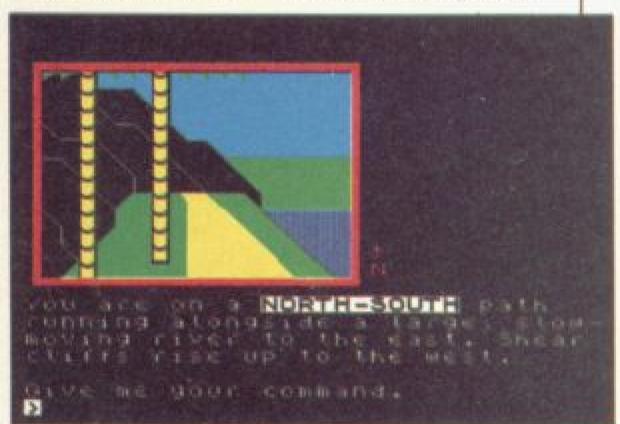
That combination makes for a classy and tense game, well made and full of action. Despite being repeatedly killed by Stripe's hooligans I enjoyed **Gremlins** a lot. My only criticism is that £9.95 is a high price to pay.

El Dorado

Heading south of Kingston Falls and slipping back several centuries in time you could find yourself sweltering in the tropical jungles of the Amazon basin. Being a bold conquistador with, I'm sorry to say, the rather juvenile name of Pisartis, you travel in search of the fabled gold of **El Dorado**.

Whilst you are slashing your way through the steaming veg you encounter the statue of the great Lord of the Sun, the god Inti. He orders you to find his golden helmet, hidden in a lost valley. Magnanimously he will let you keep any other gold you find.

El Dorado is a reasonably priced



text adventure with added graphics — those are pleasant and fast though purely decorative. The interpreter bears remarkable resemblances to the **Quill**, though I am prepared to be corrected if I am wrong — no credit was given. Whatever the case, input is in standard **Quill** format.

The game is atmospheric, descriptions are full and produce strong images to relate to. The ruined city in the valley comes to life, giving a proper sense of place. The writer is



clearly interested in the Inca period and has tried to keep within historical boundaries.

The game has about 75 locations and the action is linear — you overcome one problem at a time and then go on to the next. That is not to say the game is boring; I found the search compulsive when combined with the moody descriptions.

Add twisting jungle tracks which take you in circles and confuse your sense of direction, a few sticking points where you need to pay close attention to 'Help' information, claustrophobic tombs and subterranean passages where jaguars and pythons roam and you will find you are playing an entertaining, moderately difficult game which is real value for money.

In some ways I would rather have less locations in a game and more general detail — far too many games with 150 plus locations rely on one line descriptions and lose as a result. **El Dorado** costs less than the average night out at the pictures and will keep your brain working a lot longer. Not bad at all.

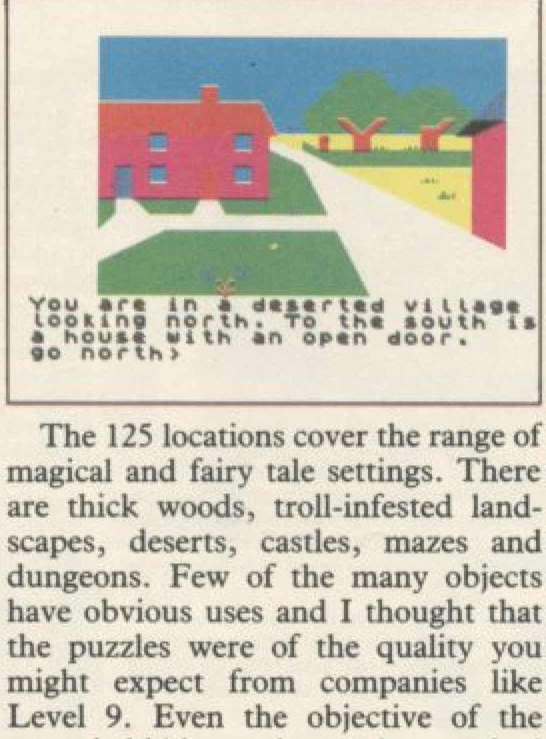
The Jewel of Power

Then there is **The Jewel of Power** from Slogger Software. At £9.50 this is another expensive game but it's big and complex. The problems are extremely involved and I suspect it would keep even veteran players struggling.

The story line is not new and revolves around your search for the missing fragments of a magic staff which will lead you to the great jewel itself. The once happy land is full of sadness and desolation as a result of its disappearance. This is a standard plot in adventuring these days and most of you who have played such games regularly will not need to adjust too much to the game's environment and rules.

The game has 'dynamic' graphics — that is, they show you the results of some of your actions and, as in **Gremlins**, are partially animated on occasions. They are strikingly primary in their colours and dominate the screen. Beneath them is the input and response area.

The game has a large vocabulary and the interpreter is sophisticated and advanced enough to notice words it does not understand as you are typing them in. That is a very friendly feature and one example of the level of skill and care put into the programming.



The 125 locations cover the range of magical and fairy tale settings. There are thick woods, troll-infested landscapes, deserts, castles, mazes and dungeons. Few of the many objects have obvious uses and I thought that the puzzles were of the quality you might expect from companies like Level 9. Even the objective of the game is hidden and must be searched for right at the beginning.

This is a high-powered, high quality expert's game and, given the amount of time it will take to solve, justifies the relatively high price. It is custom-built and other adventure programmers would do well to note some of its features. The theme is not my personal cup of tea but I'm sure it will appeal to many hardened players.

Malice in Wonderland

The **Quill** boom goes on and there are no less than four adventures written on it this month. The first, **Malice in Wonderland,** comes from Sentient Software who now market former Lumpsoft products including a Doctor Who adventure, **The Key to Time**, reviewed a while back.

The game sticks to TV and casts you loosely as Steed, from *The Avengers*. That series was renowned for its odd plots and Sentient has obliged by linking a detective-cum-spy story with bits of Alice.

Your aim is to uncover the murderer of a high ranking diplomat at the embassy of an unpronounceable Central European country. Since you do not speak the obscure tongue you are armed with a phrase book which can be used to interrogate the usual suspects — butler, chauffeur, mad chef and so on.

The embassy is curiously like the Queen of Heart's palace, with rose garden, maze, gardener and even a large rabbit burrow — which I still cannot get into, snarl, snarl. There are mirrors which seem to alter space and time and bizarre sporting objects — womballs — reminiscent of the queen's croquet balls.

The program uses the **Quill**'s resources well and is friendly and responsive. There is a good dose of tongue-in-cheek humour too — type 'Wait' and you will be treated not only to a series of observations on the nature of time but also adverts for Lumpsoft.

That quirky approach lifts **Malice in Wonderland** well above run-of-the-mill Quilled games. You do not need to follow a single line of play either and can go off at chaotic tangents if you like. Good design, great quality, grand fun.

The other three Quilled games are part of a series from Sentient Software. Those are 'back to back' tapes and feature Spectrum and CBM64 versions on either side of the cassette. They are all pure text games.

Scoop

Scoop, as you might expect, turns you into the intrepid newshound in search of the story of a lifetime. Getting to be

continued on page 115

Gemini for the 48K Spectrum

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The best in the business! Written by businessmen for businessmen, Gemini's board of Directors contains three Chartered Accountants, and their accounting software brilliantly maximises the potential of the 48K Spectrum for commercial use.

Containing a professional standard manual, the Bumper Pack is in fact a COMPLETE CASH BOOK ACCOUNTING SYSTEM replacing ALL manual records, and is ideal for the cash based business. You can transfer all receipts and expenditure records to the computer, together with Bank Account, Petty Cash records, and all VAT transactions. The system also supports 90 nominal accounts! Summaries are then prepared by the 48K, listing all the information which would normally take hours of tedious manual bookeeping... in a fraction of the time. Gemini's Cash Book Acounting System is even used by Chartered Acountants for incomplete records.

Having prepared these summaries, and a Trial Balance, the software then allows you to add details of year end adjustments, such as Depreciation, Bad Debts, Creditors and Debtors, and prepares a full Balance Sheet and Profit & Loss Account. It even produces COMPARATIVE figures, such as budgets or previous years' results, alongside the current year's figures, together with notes to the accounts.

Written to the same specification as Gemini's widely acclaimed Accounting Systems for the BBC Micro and the Commodore 64, this BUMPER PACK for the Spectrum 48K represents quite remarkable value for money, and could easily save its cost in the first week of use! Business decisions can be made more quickly and profitably, based upon accurate, up to the minute, computer data, and vital management information is available from your 48K at the touch of a key.

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Home Software Bumper Pack

Contains the following programs, all cleverly and excitingly written to STRETCH the 48K to the limit... the ideal follow up to leisure software to truly exploit the Micro's potential for ALL the family (including Mother!).

C.0417 £24.95

Database: The Gemini Database Management System is a program designed to enable the user to store all types of information in similar format to a card indexing system. The program will ask you for the headings under which you wish to store the information on a 'card', i.e. for a record collection database these might be 'Artist', 'Song', 'Composer', etc., or for example in a database set up for a deep freezer, 'Use by date', 'Value', 'Type of food', 'Shelf', etc.

Having set up your fields, you may then add, delete or change information on the 'cards' under the headings you have elected. Gemini databases contain other important and useful utilities as well, e.g. alphabetical and numerical sorting, numeric calculations, finding records that meet specific requirements, line printer routines, browsing facilities, etc. For example a list of all recordings by a particular composer, calculate total value of freezer contents, etc.

Mailist: Gemini's Mailist program will enable you to keep a record of names and addresses and then print, examine, sort and find them, all with special selection techniques, containing our exclusive 'SEARCHKEY' system, giving you the option of creating your own dedicated coding system for each name on file. For example, on most mailing list systems, you are only given the standard heading such as name, street, town, country, postcode etc. With the Gemini searchkey system, you could find, say, all names on the file that are companies having a turnover in excess of '50,000' or all names that are subscribers who are behind in their subscriptions or all names that are eligible for a Christmas card this year!

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continued from page 113

a legend in your own lunchtime means a lot of effort and a fair dose of trouble to boot.

You start by being roused by the shrill tones of your alarm and have to work your way through the day as you might in real life. Stagger out of bed, hunt for clean clothes, get washed, get breakfast, try to ignore the kids. Problems, problems . . . even your trusty, rusty old Anglia won't start.

Forget to wash and your better half will observe cuttingly that you smell rather high today. Get to the office and your boss is really unhelpful. Editors are like that, you know (I don't mean it Bill, honest . . .)

The game has a good kitchen-sink feel with plenty of unglamourous real-life stress and pressure. The interpreter could have been friendlier and more responsive to 'Exam' queries and it would have been nice to see less of 'You can't do that' on screen. I felt that was the case with all three programs.

The Crystal Frog

The other games are **The Crystal Frog** and **The Amulet.** The first is set in a familiar magical world and you must seek out the priceless carved gem of the title. Eerie castles, stalking murderers and enraged animals will dog your tracks and the atmosphere is enhanced by effective descriptions and an attention to detail.

The Amulet

The Amulet was disappointing — the plot was very similar to Level 9's **Lords of Time** with seven time zones to be journeyed through in the search for the fragments of the Time Lord's amulet. That invited comparison, though, to be fair, **The Amulet** is only a third of the price of the Level 9 program.

Travel across the zones is random so planning can be quite tough. I also found that I was getting bumped off too often and for precious little reason.

In the medieval section, already protected by a shield, I picked up a sword only to be immediately offed by an irate Norman. Although I was armed I was given no chance to fight of flee — that sort of event did not endear me to the game, especially as the same sort of thing kept happening elsewhere.

Two out of three is not bad though and once again the programs are budget-priced so they are easy on the pocket.

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Publisher Adventure International
Memory 48K **Price** £9.95
***

El Dorado
Publisher Atlantis Software
Memory 48K **Price** £1.99
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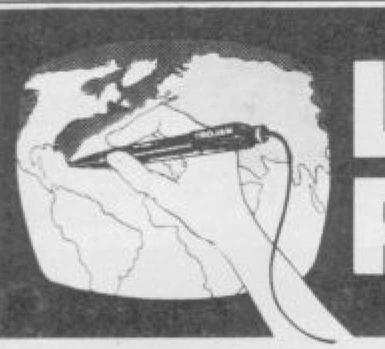
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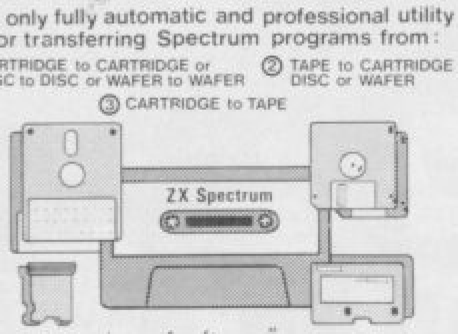
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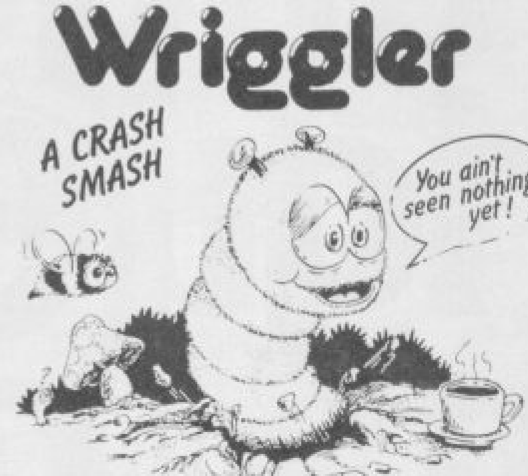


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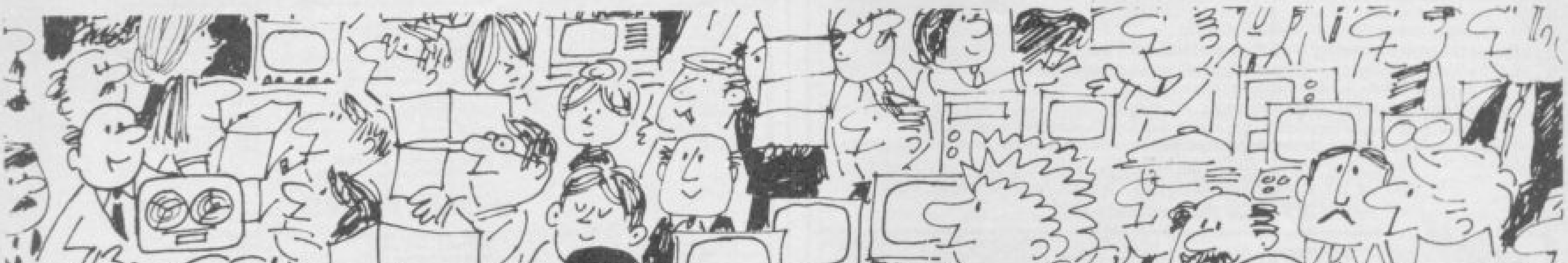
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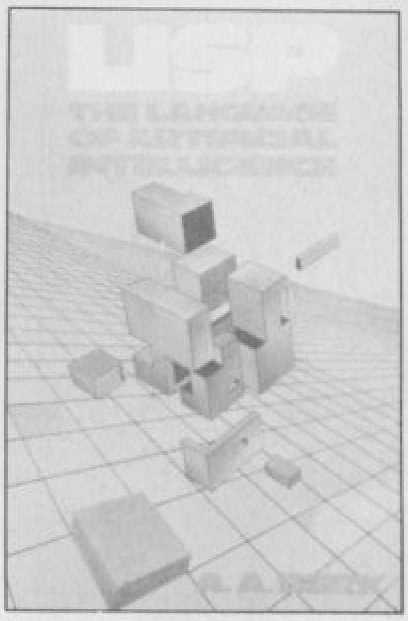
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Talking with Lisp



FOR THOSE of you who think that Lisp has certain oral connotations then *Lisp — The Language of Artificial Intelligence*, by Dr A A Berk, will be a re-education.

The book gives a general grounding in the language structure of Lisp and provides information on how it can be used to simulate artificial intelligence in any microcomputer.

The introduction to AI at the beginning of the book is sparse and to the point. It starts with a definition of AI, describing it within the context of machine intelligence, and that hoary old computer chestnut, the Turing test of machine AI. A general description of Lisp is then given showing how its simple language constructs are flexible enough for the programming of AI applications, such as the construction of coherent responses to user input and the manipulation of data to produce new output, or results.

The central section of the book is a list of the function types which can be used with Lisp and an explanation of how to use those to build your own functions.

You will find that in some ways Lisp's structure is similar to that of Forth. You can build several program routines — called functions — which can then be used in other function routines. You can even allow functions to call themselves into action. That is called recursion and, because of its importance to the usage of the language, has been allocated a long section towards the end of the book.

Finally, Dr Berk deals with the advanced features of the language and those which you can build into it. Some of those may not be available on your version of Lisp but the language should be so flexible, and easy enough to understand, that you should have no trouble in making your definitions of some of them.

An appendix at the back gives a list of standard Lisp functions so you can see just how your version of the language matches the original specification.

Dr Berk, or the publisher of the book, has made one error. Little information is given as to the origins of Lisp which was developed in the Sixties and has since been adapted to fit the needs of investigators into AI.

Despite that oversight, the book is a first-class tutorial on the subject and will be of use to anybody in language other than Basic, or in AI. *John Gilbert*

Publisher Collins
Price £9.95 (paperback)

The last word in Basic

IT WAS with a sense of déjà vu that we picked up the *Century Computer Programming Course for the Spectrum*.

We have reviewed the course before but this book edited by Professor Peter Morse and Brian Hancock, is a revised version of 544 pages. There are eight pages of contents which show that the book is split up into Basic programming, advanced Basic programming, and a series of applications programs, all of which are neatly explained using flowcharts and words.

For all its size the book only refers to Basic, so if you want to learn about machine code programming on the Spectrum then you should look elsewhere. That said the book contains just about everything you are ever likely to want to know about Basic structure and its usage. The editors have even included sections on different types of sort and search methods and one of the most understandable explanations of Spectrum graphics and screen displays ever to be published.

The two sections which really catch the eye are Memory Organisation and The Microdrive. The former gives a thorough explanation of how Basic programs are stored and manipulated in memory.

The section on microdrives gives a simple explanation of how they work with Interface One using examples every step of the way. As well as all the explanations of its usage full documentation on both microdrives and Interface One is included.

The book's style is lucid, although not particularly sparkling, and there are enough programs to break up the text into manageable chunks. *John Gilbert*

Publisher Century
Price £12.95

The computer book book

THE LATEST issue of *Computing in Print* has just been published. Its publisher, Neat Quest, describes it as 'an up-to-date computer bibliography' and contains 2200 entries across a broad range of subjects.

There are 19 sections in all, listing books on such subjects as languages, computer awareness, business, robotics and engineering. Book entries include the title, author, price, and the international book code, ISBN, should you ever want to order it.

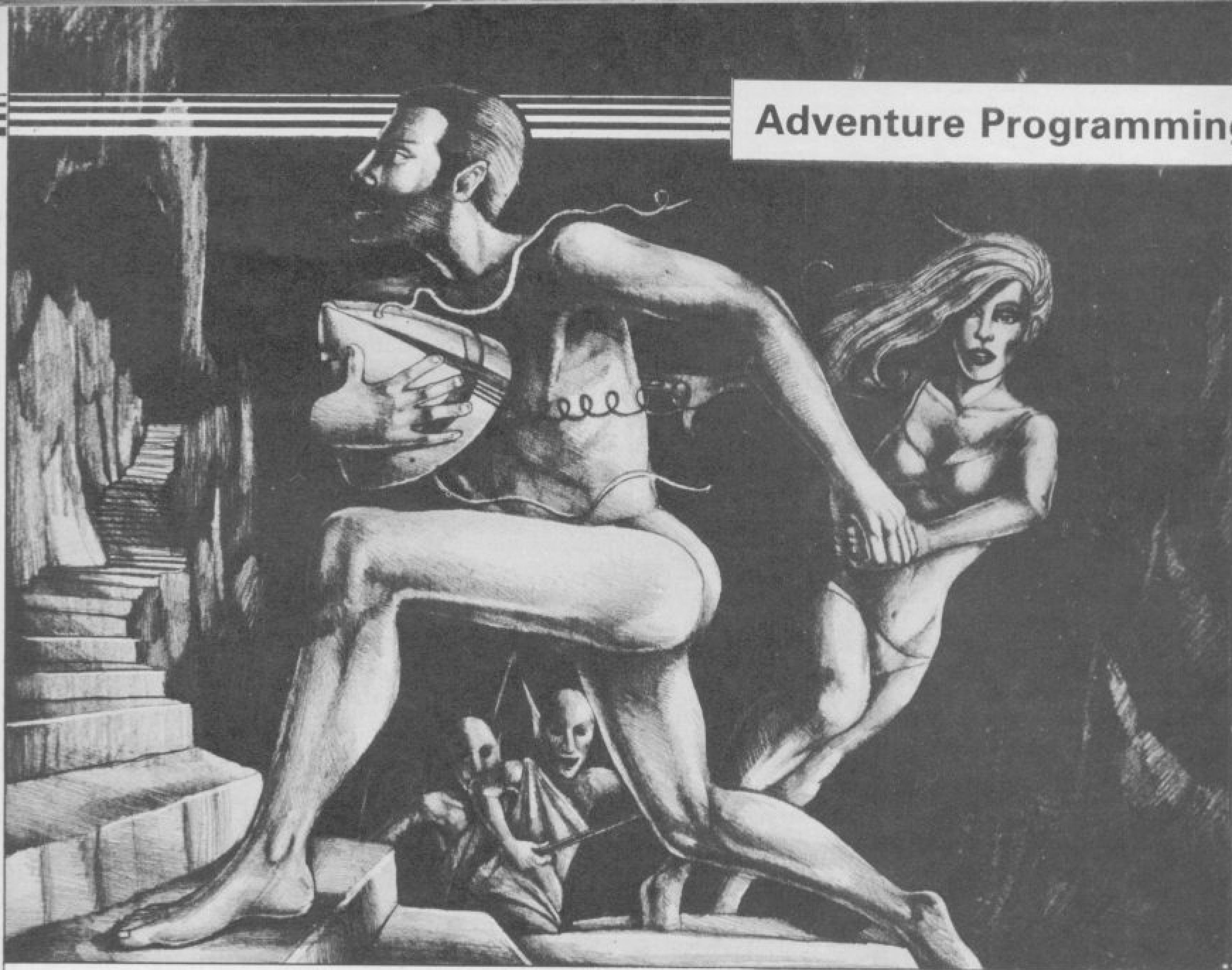
Each entry takes a classification of the type of reader suited to the book, from beginners to A level



students, into account.

The information contained within the bibliography is up-to-date but, of course, only at the time of going to press. It is, therefore, not a complete list of books and if you want a text on a fairly esoteric subject you would be better off going to a book shop with a microfiche film reference machine. *John Gilbert*

Publisher Neat Quest, Cricket Hill, Yateley, near Camberley, Surrey GU17 7PG. **Price** £2.95



Sentenced to life in adventure

John Gilbert shows how to program routines to decode English into adventurespeak

LAST MONTH we discussed the entry of information into the computer using a format which the machine would recognise without difficulty. We then built a routine which would give instructions to the computer using a keyword system similar to that which the Spectrum Plus uses.

This month we continue the line of enquiry with a look at how we can enter full English sentences to describe what we want to do and who we want to talk to within our adventure scenario.

We will continue to use the example adventure built throughout the series in which a group of scientists, Kagan and Marla, have been looking for a clock, which controls time in the universe, stolen from their research laboratory.

They have entered an underground kingdom by way of a space warp and have been taken to the leader of the city of Carvad. Making an escape they have been captured and now face an audience with the ruler and thief of the Crysan time clock.

Our heroes have a choice. They can either try to escape snatching the clock from behind the ruler's throne, or they can try to reason with the ruler.

Roughly translated into adventure speak those actions are GO, TAKE AND GO, and SAY TO. We will take each option in turn and discuss how they can be implemented within the adventure. First, however, we will take a look at how the structure of the game is affected.

Last month I said that the adventure could treat input in two ways. A large database could contain all the words which would be required throughout the game, thus making it easier to manipulate scenarios, or a word base could be built into each scene. The latter is the most flexible in an AI adventure as you can tailor actions to a specific scenario. Unfortunately you will use more RAM space than the former method but, using machine or compiled code, that should not pose a problem.

In Basic and QL SuperBasic we will use the concatenation function TO to splice the input and examine strings. If we are looking at full English sentences we need to be able to pick out the salient instruction words. For instance, the player may type in 'Please go to the north'. We do not need all of that and we use the concept of Limited Event Patterns discussed in an earlier article to find the meaningful words.

Our example adventure will have three functions built in because that is all we need. They are GO, TAKE and SAY TO. There is a limit on the number of ways which you can say these things, TAKE may also be GET, SNATCH, PURLOIN. Because the responses of a player are limited to words which will get the job done — simple words — few people will use SNATCH or PURLOIN. If they do, the computer will inform them that it cannot understand the

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sentence, in the way that **The Hobbit** does. In that way you are down to the words TAKE and GET.

In a similar way the points of the compass, up, down, left and right are all that is necessary for movement. The sentence above, 'Please go to the north', can therefore be pared down to 'Go north'.

The hard work begins. For the GO command you need a routine which will look at input to see if it is GO, find out which direction and see if there are any more directions.

Such a formula would enable the player to type in as a command 'Go to the north and then go east'. The work has been done for you as part of the listing but not for GO, as movement was dealt with in an earlier article. SAY TO is, however, illustrated.

In order to demonstrate the different techniques used for the three command-types I will show them in a form of phrase notation. For example, the GO type of instruction would be:

GO (. . . NORTH . . .) (. . . AND . . .) (. . . EAST . . .)

The GO instruction is the main phrase, and the one you should look for first within an instruction. If it is not there then you should go on to look for another instruction-type. If it is, then you look for the first phrase which is a direction. Then check to see if there is an AND phrase after the first direction. If so there must be another direction phrase.

Translated into programming practice the computer must first look for the GO substring within the instruction using a string search routine, such as that in the listing. If it finds GO then it should GOTO a subroutine for GO, such as the one shown last month, which will then use the string search routine again to find which directions it should deal with next and whether they are legal. Once found and verified they can be executed and the next instruction entered.

The GET instruction acts in a similar way:

GET (. . . CRYSAN CLOCK . . .) (AND) (. . . TORCH . . .)

If the main instruction is found then its sub-phrases are looked for and executed. In the above case, consisting of one main phrase and three sub-phrases, the clock and the torch would be collected by the player.

The fundamental part of the program is the string search routine. It can be called to find the main instruction and its sub-phrases.

At first sight, the SAY TO instruction may seem to pose a problem. It does not, but it takes a bit longer to handle. To begin with you must think of the instruction in terms of three separate sections. First there is the main command and that can be dealt with using the same search routine as GO and GET. The computer then moves to the SAY TO subroutine where the rest of the instruction is deciphered.

The name of the character to whom you want to speak follows the main instruction. At that point the computer checks to see if that character is around and whether it can, or wants to, speak. If it does not, a message to that effect is printed and a return is made to the instruction entry routine.

If the character is willing to speak the next part of the instruction is decoded. It will probably be an instruction or a question. Again the string search routine will come in for some heavy use but the string within quotation marks can be treated as just another instruction. It is as simple as that and the instruction could be represented as:

SAY TO (. . . ALIEN . . .) (. . . "GIVE ME THE CLOCK" . . .)

That type of instruction is demonstrated in the listing.

Some players will want to type multi-clause instructions. There is no problem. All you have to do is build into the program a series of IF statements in the main loop which will execute your instructions one at a time. For instance, imagine the instruction GO EAST AND NORTH. GET THE ROPE AND SAY TO ALIEN "GIVE ME THE CLOCK".

You need to make the computer recognise the full stop as the terminator of an instruction. The computer executes a particular instruction type until it arrives at the full stop when it again looks for the type of instruction to be found in the part of the line.

While the full stop can be used to terminate a clause, the word AND can be used to join two actions together in one clause, as in GO EAST AND NORTH, or it can be used to join two clauses together, as in GET THE ROPE AND SAY TO ALIEN . . .

To get the computer to recognise the two uses of AND you can use IF statements in the main loop. The computer will execute the first command, find an AND, use IF to determine the type of AND it is, then either use the last command-type issued, or decode what follows AND as a new clause.

The program in the listing shows how instructions are decoded. It is an example of a SAY TO instruction during the audience with the rule of Carvad. The REM instructions explain the Basic coding.

The ruler is not very talkative so it would be best after asking him where the clock is to TAKE it and help Kagan and Marla escape.

Next month, in the final part of this series, we take all the routines so far illustrated and show how they can be cemented together using an adventure master plan. Be ready to type in a lengthy listing, and learn the ultimate fate of Kagan and Marla.

```
10 CLS
11 REMark ENTER INSTRUCTION
20 INPUT a$
21 REMark START OF MAIN LOOP TO
SEE WHICH TYPE OF COMMAND IS IN
OPERATION
30 FOR k = 1 TO LEN(a$)
32 REMark G=GO AND S=SAY TO
40 IF a$(k)="G" OR a$(k)="S" THE
N GO TO 100
41 REMark GO TO 200 IF MAIN COMM
AND TYPENOT FOUND YET
50 GO TO 200
51 REMark FURTHER CHECK ON INSTR
UCTION TYPE
100 IF a$(k TO k+1)="GO" THEN GO
 TO 300
101 IF a$(k TO k+5)="SAY TO" THE
N GO TO 310
200 NEXT k
201 STOP
202 REMark MOVEMENT ROUTINE SHOU
LD BE SITUATED HERE.
300 PRINT "A DIRECTION"
303 REMark GO BACK FOR MORE INPU
T
305 GO TO 20
310 PRINT a$
311 REMark CHECK TO SEE IF PLAYE
R CALLED CORRECT CHARACTER IE. A
N ALIEN.
320 IF a$(8 TO 11)="ALIE" THEN G
O TO 340
321 REMark NOT ASKED FOR CORRECT
 CHARACTER
330 PRINT"NO CHARACTER OF THAT N
AME HERE":PAUSE 0: GO TO 10
331 REMark START OF SCAN TO FIND
 APOSTROPHE WHICH REPRESENTS QUO
TE MARK.
340 LET M=1
350 IF a$(M)="'" THEN GO TO 1000
351 REMark /IF NOT FOUND ERROR IN
 INSTRUCTION.
360 IF M=LEN (a$) THEN PRINT"I D
ON'T UNDERSTAND": GO TO 10
361 REMark CONTINUE SCAN
370 LET M=M+1: GO TO 350
380 REMark TAKE EVERYTHING BETWE
EN QUOTE MARKS AND PUT IN NEW VA
RIABLE TO BE TREATED AS SEPARATE
 INSTRUCTION STRING.
1000 LET B$=a$(M+1 TO LEN (a$)-1
)
1001 REMark MONSTER REPLIES BUT
YOU CAN INSERT MORE IFS FOR REPL
IES OR USE THE STRING SEARCH TEC
HNIQUE AGAIN.
1010 IF B$="WHERE IS THE CLOCK"
THEN PRINT "THE ALIEN SAYS: 'IT
IS BEHIND MY THRONE, BUT THAT IS
 OF LITTLE MATTER TO YOU.'"
```

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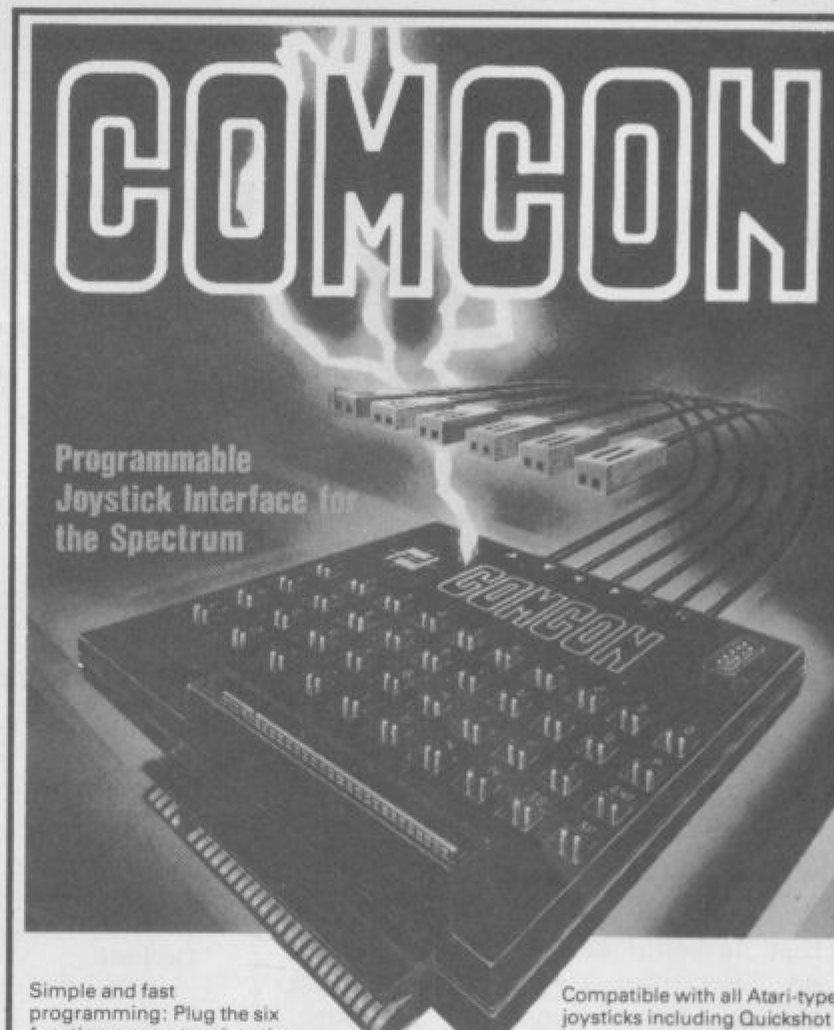
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Andrew Hewson demonstrates a routine to provide functions at a stroke

Discovering the key to complex commands

OCCASIONALLY I receive a letter which appears to present an impossible challenge but on closer inspection yields a satisfactory answer. An example is this request from John Whitehead of Aylesbury: **I note that some home computers, including the BBC, have so-called function keys on the keyboard. What are they and can I have some on my Spectrum?**

I decided that I could answer John's first question but I was not at all sure that he could have function keys on his Spectrum, at least not without buying some special hardware. However, I showed the letter to a colleague, Keith Prosser, and he came up with a function key routine.

As the routine builds on some of the material which I have been writing about recently — in particular, it makes use of interrupt mode 2 which I wrote about last month — I knew that it would make first class material for this column.

So what are function keys? Well, put very briefly they are keys which can be defined to generate an entire string from a single press of a key. The string could be a command or group of commands so that your computer could, in principle, be directed to execute a complete sequence of commands from a single key press. For example, you might wish to execute the following command group every time you pressed the '1' key:

PAPER 7: INK 0: BRIGHT 0: FLASH 0

The BBC has 10 special keys, each of which can be defined in this way. Of course, the Spectrum has no special keys and so it is not possible to obtain a function key effect at a single keystroke.

The routine which Keith wrote simulates the desired effect by requiring the user to press SYMBOL SHIFT and SPACE at the same time — a combination which is not normally defined on the Spectrum — before the "function" key. Thus SYMBOL SHIFT and SPACE followed by 1 could be used to call up the PAPER/INK/BRIGHT/FLASH string suggested above.

Before describing Keith's routine in detail some recapping is in order.

Spectrum interrupts

The Spectrum normally operates in interrupt mode 1 and in this mode an external interrupt forces the Z80 microprocessor to stop what it is doing, save the register contents and jump to location 56 and execute the code stored at that point.

The Spectrum hardware generates an interrupt 50 times every second and the main function of the routine at address 56 in the Spectrum ROM is to update the FRAMES system variable and scan the keyboard to see if a key has been pressed.

The Spectrum owner can take control of the interrupt system by setting interrupt mode 2. In that mode an external interrupt forces an indirect jump — a jump to an address deter-

Decimal		Assembler	Comment
		org 0feffh	
1 255		defw 0ff01h	IM2 vector
245	intpt:	push af	preserve AF
253 203 1 106		bit 5 (iy + 1)	not key press so
203 57 0		jp 57	do normal interrupt
58 173 255		ld a, (flag)	which mode?
61		dec a	
32 82		jr nz,instr	
237 86		im 1	flag=1 means wait for function key
251		ei	
253 203 1 222		set 3, (iy + 1)	
62 8		ld a,8	print flashing 'f' cursor
215		rst 10h	
62 70		ld a,"F	
205 149 255		call key0	get key press
253 203 1 106	b0:	bit 5, (iy + 1)	
40 250		jr z,b0	
58 8 92		ld a,(23560)	
254 32		cp 32	reject space
40 243		jr z,10	
243		di	
237 94		im 2	reset interrupt mode
229		push hl	scan for definition chosen
197		push bc	
79		ld c,a	
42 171 255		ld hl (defs)	
126	m0:	a, (hl)	
167		and a	
40 10		jr z,notdef	
185		cp c	
40 19		jr z,found	
126	c1:	ld a, (hl)	
35		inc hl	
167		and a	
32 251		jr nz,c1	
24 242		jr m0	
193	notdef:	pop bc	no string defined for this key
225		pop hl	so just do normal interrupt
253 203 1 174		res 5, (iy + 1)	and clear flag
50 173 255		ld (flag),a	
195 57 0		jp 57	
35	found:	inc hl	definition found so
34 174 255		ld (ptr),hl	save pointer to string
253 203 1 174		res 5 (iy + 1)	
62 2		ld a,2	set flag to 'started'
50 173 255		ld (flag),a	
193		pop bc	

Table 1. A Spectrum machine code routine to enable a key to be defined as a function key provided SYMBOL SHIFT and SPACE precedes the required keystroke.

mined by the contents of a location which has previously been set by the user. The machine will then execute the code installed by the user at that address, and providing it is terminated by a jump to the ROM interrupt routine, all will be well.

Scanning the keyboard

The Spectrum ROM interrupt service routine sets bit 5 of the flags system variable at address 23611 to indicate that a key has been pressed. The code of the key being pressed is stored in the LASTK system variable at 23560. It is a simple matter for the user to pick up a keystroke by monitoring the status of bit 5 of flags. It is of course important to clear the bit after a keystroke has been accepted.

Printing on screen

The function key routine makes extensive use of the ROM routine at address 16 — 10 hex — for PRINTing characters on the screen. The routine is entered with the code — as listed in the Spectrum Manual, appendix 1 — of the character to be PRINTed stored in the A register. The AF register pair is corrupted by this routine but all other registers are preserved. The routine is best called using the special RST 16 — RST 10 hex — instruction.

There is another ROM routine, at address 5633 — 1601 hex — which should normally also be used when PRINTing. The routine behaves as a sort of OPEN command except it is used from machine code. It directs subsequent PRINTing to the required location. Call that routine with the A register containing the number of the channel required, channel one being the lower part of the screen, channel two being the upper part of the screen and channel three being the ZX printer. All registers are corrupted by this routine.

```
10 FOR I = 65279 TO 65535
20 INPUT J
30 POKE I,J
40 PRINT I,J
50 NEXT I
```

Table 2. A simple decimal loader for POKEing decimal numbers into high memory.

Now for the function key routine itself. The routine is listed in table one and can be entered either using an assembler or POKEd into place using the simple decimal loader listed in table two. The routine is designed to reside close to the top of memory starting at address 65279. The space above the routine is used to store the command definitions, and so on, to be attached to the keys required. The Basic editor in table three can be used to create these definitions.

```
225                    pop hl
241                    pop af
251                    ei
237 77                 reti                finish
61              instr: dec a               here if started
32 31                  jr nz,fkey          generating the string
229                    push hl
42 174 255             ld hl,(ptr)         fetch next character and
126                    ld a,(hl)
50 8 92                ld (23560),a        put it in LASTK
35                     inc hl              increment pointer
34 174 255             ld (ptr),hl
225                    pop hl
167                    and a               is string finished?
253 203 1 238          set 5 (iy + 1)
32 7                   jr nz,m1
50 173 255             ld (flag),a         if it is then clear flag
253 203 1 174          res 5, (iy + 1)     and return
241                m1: pop af
251                    ei
237 77                 reti
62 127           fkey: ld a,›32766         check for symbol shift and space
219 254                in a, (254)         simultaneously
230 3                  and 3               not pressed so normal key scan
194 57 0               jp nz,57
62 1                   ld a,1              set flag = 1 if pressed
50 173 255             ld (flag),a         and return
251                    ei
241                    pop af
237 77                 reti
253 203 85 254   key0: set 7, (iy + 85)    print flashing cursor
215                    rst 10h
253 203 85 190         res 7, (iy + 85)
62 8                   ld a,8
215                    rst 10h
201                    ret
243                go: di                  activate the key function
62 254                 ld a,254            key system
237 71                 ld i,a
237 94                 im 2
251                    ei
201                    ret
177 255          defs: defw defad
                 flag: defb 0              pointer to definitions
                                           flag=1 if symbol + space got pressed
                                           flag=2 if in generating string
                                           flag=0 for 'normal' operation
                  ptr: defw 0
                 ptr2: nop
                defad: nop                 start of definitions
```

Interrupt mode 2

The routine is entered at address 65442, equivalent to the 'go' label close to the end of the listing in table one. The opening subroutine loads the I register with the value 254 and sets interrupt mode 2. The number 254 placed in the I register, when combined with the 255 which is supplied automatically by the Spectrum hardware, forms the location from which the starting address of the new interrupt service routine is to be taken. Thus the location inspected is

$$254 * 256 + 255 = 65279$$

That address is right at the beginning of the main routine and it points in turn to the required entry point two bytes later at address 65281.

Thus the effect of the 'go' subroutine and the data stored in locations 65279 and 65280 is to cause all subsequent interrupts to force a jump to location 65281 — to the beginning of the new interrupt service routine.

Detecting a keystroke

The first thing the new routine at 65281 does is to check if bit 5 of flags has been set, indicating that a keystroke was detected on the previous interrupt cycle. If the bit is not set, a key has not been pressed so that there is no point in doing any more work. Hence the routine jumps immediately to address 57 at the beginning of the ordinary ROM interrupt service routine so that normal keyboard scanning can take place as usual.

continued on page 126

continued from page 125

If the bit is set the next task is to determine if that indicates a normal keystroke or whether it is a special message from 'ourselves'. The latter occurs when the routine is part way through putting a function key string on the screen. The routine determines which is the case by inspecting the special internal variable called 'flag' which is stored at the end of the routine. If 'flag' contains two then a string is being PRINTed and the routine jumps to 'instr' to carry on the job.

If 'flag' equals one that indicates that SYMBOL SHIFT and SPACE were pressed at the same time so that the next keystroke must be interpreted as a function key. When that occurs a flashing 'F' is PRINTed and the routine reverts to interrupt mode 1 to avoid any confusion and waits for the next keystroke to occur.

When the next keystroke occurs the list of definitions is scanned for the chosen key and the 'ptr' and 'flag' variables are set appropriately. If the key selected has no definition attached to it some tidying up takes place.

```
10   CLEAR 65270
15   LET defs=65457
20   POKE defs-1,0:POKE defs,0
22   :
23   REM line 20 clears any existing
     definitions
24   :
25   PRINT #1: "which key to define?";:
     PAUSE 0:CLS:let a$=INKEY$
30   IF a$=" " THEN GO TO 9999
40   INPUT "define key ";(a$);k$
50   PRINT #1;"do you want an
     ENTER?
     (Y/N)":PAUSE 0: LET
     b$=INKEY$: CLS
60   IF b$="y" THEN LET
     k$=k$+CHR$ 13: GO TO 80
70   IF b$<>"n" THEN GO TO 50
80   FOR a=defs-1 TO defs+255
90   IF PEEK a=0 AND PEEK (a+1)=0
     THEN GO TO 110
100  NEXT a: PRINT "defs full": GO TO
     10000
110  POKE a+1, CODE a$: LET a=a+1
115  FOR i=a+1 TO a+LEN k$: POKE
     i, CODE k$(i-a): NEXT i
120  POKE i,0: POKE i+1,0
150  GO TO 25
200  FOR a=defs TO defs+30: PRINT
     CHR$ PEEK a: NEXT a
250  GO TO 10000
300  CLEAR 65270: LOAD
     *"m";1:"codel"CODE : RUN
9999 RANDOMIZE USR 65442
```

Table 3. A Basic program to create the keystroke definitions required by the machine code routine listed in table 1.

Defining strings

The address of the key definitions is stored in the 'defs' variable. That in turn points to address 65247 so that there are 79 bytes beneath the top of memory in which key definitions can be stored.

The definitions are stored in the form:

first byte : key defined

bytes 2 to n : the characters required

byte n + 1 : zero

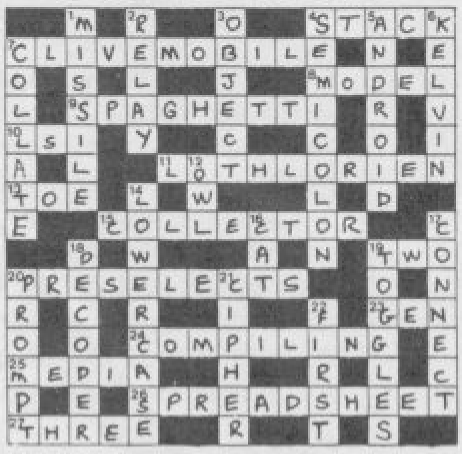
The entire list of definitions is also terminated by an additional zero.

The Basic program in table three will allow you to experiement with definitions of your own function keys. You save the machine code in a file called 'code1' and save the Basic program using line 300.

On running the program you will be prompted to press the key which you wish to define as a function key and the string which you wish to call up. You are not allowed to use SPACE as a function key because it is taken as an indication that you wish to stop adding key definitions.

● *Please address problems and queries to Andrew Hewson, Helpline, Graham Close, Blewsbury, Oxfordshire.*

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